Oral Interventions for Obstructive Sleep Apnea

Koretsi, Vasiliki ; Eliades, Theodore ; Papageorgiou, Spyridon N

Abstract: BACKGROUND The effectiveness of intraoral appliances (IOA), maxillary expansion (ME), and maxillomandibular advancement (MMA) in the treatment of children and adults with obstructive sleep apnea (OSA) has not yet been adequately assessed. METHODS An umbrella review was performed based on established guidelines for evidence-based medicine. Data synthesis was performed only from randomized controlled trials with Paule-Mandel random-effects meta-analyses / meta-regressions using mean differences (MDs) and 95% confidence intervals (CIs) and was followed by the qualitative evaluation of the meta-evidence. RESULTS 29 systematic reviews were included, 7 of which provided quantitative data. IOA were effective in improving apnea hypopnea index (AHI) compared to both, placebo appliances (12 trials; 525 patients; MD = -11.70; 95% CI: [-15.38; -8.01]; p<0.001) and no treatment (1 trial; 24 patients; MD = -14.30; [-21.59; -7.01]; p<0.001). Only the former comparison was supported by robust meta-evidence. Effectiveness of IOA as measured by the Epworth Sleepiness Scale, on the other hand, was not supported by robust meta-evidence. No randomized or prospective controlled trials were found on the effectiveness of ME (conventional or surgically assisted) and MMA. CONCLUSION Intraoral appliances are effective in reducing AHI and their use is substantiated by robust evidence. There is no evidence from high-quality research to support treatment with ME (conventional or surgically assisted) or MMA in patients with OSA.

DOI: https://doi.org/10.3238/arztebl.2018.0200

Oral interventions in obstructive sleep apnea

An umbrella review for the effectiveness of oral appliances, maxillary expansion, and maxillomandibular advancement

Dr. med. dent. Vasiliki Koretsi, Prof. Dr. Theodore Eliades, Dr. med. dent. Spyridon Papageorgiou

Department of Orthodontics, University Hospital Regensburg, Regensburg, Germany: Dr. Koretsi
Clinic of Orthodontics and Pediatric Dentistry, Center of Dental Medicine, University of Zurich, Zurich, Switzerland: Prof. Dr. Eliades, Dr. Papageorgiou

Corresponding author: Dr. Vasiliki Koretsi, Department of Orthodontics, University Hospital Regensburg, Franz-Josef-Strauß-Allee 11, 93053 Regensburg, Germany
Tel.: 0049 941 944 6052; Email: koretsi.vasiliki@gmail.com

Keywords: review, obstructive sleep apnea, mandibular advancement, palatal expansion technique, obstructive sleep apnea/surgery*
Schlüsselwörter: Review, obstruktive Schlafapnoe, intraorale Geräte, Gaumennahterweiterung, Umstellungsosteotomie

Words in the english manuscript: 2268
Words in the english summary: 240

SUMMARY

Background: Obstructive sleep apnea (OSA) affects 1-4% of children and 3-7% of adult population. Effectiveness of oral appliances (OA), maxillary expansion (ME), and maxillomandibular advancement (MMA) in the treatment of OSA has not yet been adequately assessed in an evidence-based manner in children and adults.

Method: An umbrella review was performed based on Cochrane Handbook and PRISMA statement to provide an overview of existing systematic reviews. Data synthesis was performed only from randomized controlled trials with Paule-Mandel random-effects meta-analyses / meta-regressions using Mean Differences (MDs) and 95% Confidence Intervals (CIs) and was followed by the qualitative evaluation of the meta-evidence.

Results: 29 systematic reviews were included (until August 2016), 7 of which provided quantitative data and 20 primary studies (until 2015). OA were effective in improving apnea hypopnea index (AHI) compared to both placebo appliances (12 trials; 525 patients; MD=-11.70; 95% CI=-15.38,-8.01; p<0.001) and no treatment (1 trial; 24 patients; MD=-14.30; 95% CI=-21.59,-7.01; p<0.001). Only the former was supported by robust meta-evidence. Effectiveness of OA compared to placebo on Epworth sleepiness scale and minimum oxygen saturation was low and moderate, respectively, and was not supported by robust meta-evidence. No randomized or prospective controlled trials were found on the effectiveness of ME (conventional or surgically assisted) and MMA.

Conclusion: OA are effective in reducing AHI and their use is substantiated by robust evidence. Treatment with ME (conventional or surgically assisted) and MMA cannot yet be supported by high quality research.

The clinical aspect

Oral appliances (OA) for the treatment of obstructive sleep apnea (OSA) work mechanically, by holding and stabilizing the mandible in a forward position and thus increasing the upper airway dimensions. Custom OA based on dental impressions are believed to be more effective than non-custom ones and cooperation with a qualified dentist / orthodontist is desired. OA are usually used in mild to moderate OSA patients and severe OSA patients, who cannot tolerate continuous positive airway pressure.

Rapid maxillary expansion to treat maxillary constriction can be performed in growing children by orthodontists. It opens the midpalatal suture and leads to a transverse expansion of the maxilla. Apart from the benefits of a balanced occlusion, this increases the nasopharyngeal airway and reduces nasal resistance facilitating nasal breathing. It is also believed that it leads to repositioning of the tongue anteriorly.

Surgically assisted rapid maxillary expansion to treat maxillary constriction is performed in adults by maxillofacial surgeons and orthodontists cooperatively. In adults, due to the ossification of the midpalatal suture, maxillary expansion has to be surgically assisted to maximize skeletal changes, otherwise it leads to dentoalveolar compensation (tipping of teeth). Adults enjoy the same treatment benefits as children.

Maxillomandibular advancement (MMA) is performed in adults by maxillofacial surgeons in cooperation with orthodontists. It advances the maxillomandibular complex in the sagittal plane thereby increasing the dimensions of the upper airway and the tone of the pharyngeal muscles. MMA is not a routine treatment in OSA and has to be anatomically indicated and carefully planned. Cephalometric analyses provide crucial help in identifying the anatomical site(s) of obstruction and in defining the limits of advancement to preserve facial aesthetics postoperatively.

Introduction

Obstructive sleep apnea (OSA) is a sleep-related disorder and refers to the repetitive narrowing or collapse of the upper airway, which leads to partial (hypopnea) or complete (apnea) cessation of the airflow during sleep (1). OSA is a common medical condition that affects 1% to 4% of children with a higher prevalence in boys than girls (2) as well as 2% to 5% of adult female and 3% to 7% of adult male population (3).

Risk factors for OSA development are characteristics and conditions, such as posterior position of the mandible (4, 5), obesity (6, 7), menopause (8, 9), high nasal airway resistance (10, 11), and smoking (12, 13). An overview of OSA pathophysiology and associated risk factors is given in *Figure 1* adapted from Jordan *et al*. (14). Since some well-established risk factors have a genetic background, OSA aggregates within families (15). However, susceptibility to OSA among family members is not fully explained by familial aggregation of other risk factors, such as obesity (16, 17).

The impact of OSA on patients is considerable. Lack of energy seems to be the most important complaint (18), although daytime sleepiness is also reported by 46%-47% of OSA patients (18, 19). Additionally, OSA sufferers have an elevated risk of motor vehicle crashes, although the actual number of accidents is not so frequent (20). Furthermore, their cognitive performance is impaired and that is related to OSA severity (21, 22), while their perceived quality of life appears to resemble that of other chronic diseases (23).

Available symptomatic or causative treatments include lifestyle interventions -especially weight loss, oral appliances (OA), continuous positive airway pressure (CPAP), pharmacological agents, and surgery (24, 25). Additionally, in orthodontics, maxillary expansion has been thought to increase the upper airway dimensions and thus alleviate OSA symptoms (26). Overall, dental science is implicated in many OSA treatment modalities including OA, rapid maxillary expansion (RME) in children, surgically assisted rapid maxillary expansion (SARME) in adults, and surgical maxillomandibular advancement (MMA) (24–30).

Here, we aimed to comparatively investigate the effectiveness of OSA treatment modalities for children and adults that are of interest to dentists / orthodontists by conducting an umbrella review of systematic reviews. Furthermore, we intended to systematically assess evidence on these interventions and to identify potential biases that could affect their findings.

Materials and methods

Protocol, registration, conduction, and reporting

The protocol for this study was made *a priori* and registered in PROSPERO (CRD42016045840). All *post hoc* changes are appropriately mentioned. The review was conducted according to the Cochrane Handbook (31) and reported according to the PRISMA statement (32). Guidelines provided by Aromataris *et al.* (33) were also considered.

Eligibility criteria, study identification and selection

Three search queries were created and appropriately adjusted to each electronic database systematically searched from inception to August 14th, 2016 (*eTable 1*). Firstly, systematic reviews were checked for inclusion according to the eligibility criteria for systematic reviews (*eTable 2*). Secondly, all primary studies of each included systematic review were extracted and checked according to the eligibility criteria for primary studies (*eTable 2*). A detailed description is provided in *eMethods*.

Data extraction

From each eligible systematic review, two authors (VK and SNP) extracted independently information. For further data extraction, we only considered the included systematic reviews, in which meta-analyses with comparison groups were provided. If an article presented separate meta-analyses on more than one eligible outcomes, those were assessed separately. Data extraction was based on the results provided in the included systematic review. In cases of discrepancies across systematic reviews, we directly extracted data from their corresponding primary studies. Additionally, data for the predefined subgroup analyses was directly extracted from primary studies. Further details are provided online (*eMethods*).

Assessment of summary effects and heterogeneity

For meta-analyses of continuous outcomes, Mean Differences (MDs) of the treatment-induced increments were chosen as effect estimates, while Risk Ratios (RRs) were chosen for binary outcomes. Based on clinical and statistical reasoning (e3), we estimated the summary effects with a random-effects model using the Paule-Mandel estimator instead of the commonly used DerSimonian-Laird, due to the improved performance of the former (e4). All calculations were performed in STATA version 12 (StataCorp, College Station, TX, USA). Further details on assessment of summary effects

and heterogeneity, assessment of small study effects, and criteria for epidemiological associations are provided in *eMethods*.

Results

Characteristics of included systematic reviews

A total of 497 hits were received from the electronic searches (*eFigure 1*). After excluding inappropriate studies (*eTable 3*), a total of 29 systematic reviews were included. *Table 1* provides an overview of the characteristics of the included systematic reviews and *eBox 1* a detailed description.

Risk of bias and methodological adequacy

Table 1 reports on the assessment of risk of bias in the included systematic reviews and *eTable 4* provides results for their methodological adequacy. A detailed description is provided in *eBox 2*.

Summary effect sizes

From the included systematic reviews, 18 (62%) performed meta-analyses of any kind of studies. After applying the eligibility criteria to their corresponding primary studies (including primary studies with comparison groups and excluding inappropriate study designs), data from 7 systematic reviews based on 20 primary studies (*eTable 5*) were extracted. After removing duplicate primary trials and pooling, 8 meta-analyses of cumulative evidence could be conducted on the primary outcome apnea hypopnea index (AHI) and the secondary outcomes Epworth Sleepiness Scale (ESS) and minimum oxygen saturation (MOS). These pertained to comparisons of OA with placebo appliances, no treatment, or different appliances (custom OA based on impressions, pre-fabricated OA, or tongue suction OA) in the treatment of OSA in adults (*Table 2*). No comparisons on RME, SARME, and MMA were available.

As far as the comparison of OA versus placebo appliances is concerned (*Table 2*; *Figure 2*), a considerable improvement was evident with OA in AHI (MD=-11.7; 95% CI=-15.38, -8.01; p<0.001), small marginally non-significant effects were noticed on ESS (MD=-1.18; 95% CI=-2.38, 0.03; p=0.055), and moderate effects on MOS (MD=3.33; 95% CI=1.38, 5.28; p=0.007). High heterogeneity (I^2>75%) was found in the meta-analyses of AHI and MOS. However, this posed a threat to the results only for the latter meta-analysis. For the former meta-analysis, the 95% prediction interval that incorporates existing heterogeneity was consistent to the left side of the forest plot. Additionally, compared to no treatment, OA were found effective in improving AHI (MD=-14.30; 95% CI=-21.59, -

7.01; p<0.001 as continuous and RR=0.37; 95% CI=0.15, 0.90; p=0.029 as binary outcome), but not in improving ESS (MD=-1.00; 95% CI=-3.77, 1.77; p=0.479). Finally, as far as comparisons between different appliance designs are concerned, increased vertical opening (14 mm instead of 4 mm) did not influence AHI (MD=-2.00; 95% CI=-6.51, 2.51; p=0.385) and significantly hampered improvement in ESS (MD=-6.00; 95% CI=-8.41, -3.59; p<0.001). However, this was based on a single trial and additional evidence is needed before any conclusions can be drawn.

Associations meeting the epidemiological criteria

From the cumulative evidence on the performance of OA, only the large improvement in AHI compared to placebo appliances was supported by robust evidence, i.e. had adequate sample, heterogeneity was not an issue, the random-effects predictive intervals were consistent in favour of the intervention, and no signs of reporting biases were found (*Table 3*).

Discussion

This umbrella review of systematic reviews summarizes existing evidence from randomized trials on the effectiveness of OA, RME, SARME, and MMA in the treatment of OSA. A total of 29 systematic reviews were included in the qualitative synthesis, while eligible trials from 7 of these also contributed to the quantitative synthesis. Comparisons were available only for OA, since for RME, SARME, and MMA no high quality evidence was identified.

Considerable evidence indicated that OA are effective in treating OSA in adults and improving AHI compared to both placebo appliances and no treatment. The former comparison was the only one that met all the criteria for strong epidemiological associations (e42) indicating strength of evidence. By mechanically holding the mandible in a forward position, OA not only affect the anteroposterior dimension but also provoke an increase in the lateral diameter of the velopharynx (e43). In growing children with malocclusion, functional appliances for stimulating mandibular growth might alleviate OSA symptoms (e44, e45), but evidence is scarce and thus more research is needed. In regard to the secondary outcomes, OA might have a positive effect on ESS and MOS (*Table 2*). However, the epidemiological strength of the association (e42, e49) was poor, mostly due to the limited number of contributing studies.

As far as modifying factors on the effectiveness of OA are concerned, subgroup analyses and meta-regressions indicated that baseline AHI levels were significantly associated with the observed

AHI reduction (*eTable 6*). This could mean that patients with more severe OSA symptoms are more likely to experience greater improvements in AHI, while the same association between baseline severity and improvement of symptoms was also noticed for the effect of OA on MOS (*eTable 7*), but not ESS (*eTable 8*). Although there were some indications of small-study effects, this was not confirmed with the Egger's test. Furthermore, this association could also be explained by "regression to the mean" and needs further confirmation. It is also important to note, that OSA baseline severity might directly influence treatment choices (30) leading to OA being used more in mild to moderate cases with non-compliance to CPAP, since CPAP appears to be more effective in complete resolution of OSA compared to OA (28). Although OA are not as effective as the first-line option, CPAP, in reducing AHI (e46, e47), they might be better preferred by patients, since CPAP is associated with more serious negative aspects, which influence adherence (e47, e48) and thus treatment effectiveness. Due to this fact, OA could be used alternatively to CPAP in mild to moderate OSA and in severe OSA, if CPAP is not tolerated (30).

Although RME, SARME, and MMA in the treatment of OSA could not be supported by robust evidence, existing literature could be suggestive of their effectiveness. In a randomized crossover trial comparing RME with adenotonsillectomy in children, AHI was reduced after RME in the first arm of the trial (e50). Moreover, it seems that this reduction remains stable after 36 months (e51). In adults, SARME with mini-implants reduced AHI postoperatively (e52). Finally, although existing literature on MMA is mainly comprised by inappropriate study designs, MMA seems to be as effective as CPAP with AHI pre- and postoperatively comparable to AHI pre- and post-CPAP (e53).

Strengths and weaknesses

Firstly, the present umbrella review was based on robust methodology (e42, e49) that was set out *a priori* and registered in PROSPERO (e54). Secondly, study selection and data extraction were also based on the level of primary studies included in the identified systematic reviews. As a result, this report synthesized only randomized trials (since no prospective controlled trials were found) and accuracy of the data was insured. Thirdly, the Paule-Mandel estimator of random-effects model was used as it outperforms the DerSimonian-Laird variance estimator (e4). Finally, the robustness of existing cumulative meta-evidence was judged on basis of valid protocols of epidemiological strength (e42, e49).

On the other hand, several limitations should be considered in the interpretation of our findings. Firstly, we might have missed some individual studies, if those were not identified in the original systematic reviews. Secondly, most of the included systematic reviews presented serious methodological inadequacies. Thirdly, funnel plot asymmetry was consistently investigated with Egger's test for all meta-analyses according to previous umbrella reviews (e42, e49, e55), although less than ten trials were included in every case (e9).

Key messages

- According to criteria for robust epidemiological associations, OA are effective in reducing AHI in OSA adult patients and this cannot be explained by placebo effects.
- The epidemiological evidence for the effect of OA on ESS and MOS in OSA adult patients was poor.
- There is no robust scientific evidence to support the treatment of RME, SARME, and MMA in OSA patients.

Conflict of interest statement

The authors declare that no conflict of interest exists.

References

1. Park JG, Ramar K, Olson EJ: Updates on definition, consequences, and management of obstructive sleep apnea. Mayo Clin Proc 2011; 86: 549–54.
2. Lumeng JC, Chervin RD. Epidemiology of pediatric obstructive sleep apnea. Proc Am Thorac Soc 2008; 5: 242–52.
3. Punjabi NM. The Epidemiology of Adult Obstructive Sleep Apnea. Proc Am Thorac Soc 2008; 5: 136–43.
4. Dobrowolska-Zarzycka M, Dunin-Wilczyńska I, Szymańska J: Craniofacial structure in patients with obstructive sleep apnoea. Folia Morphol (Warsz) 2016; 75: 311–5.
5. Lee RWW, Vasudavan S, Hui DS, et al.: Differences in craniofacial structures and obesity in Caucasian and Chinese patients with obstructive sleep apnea. Sleep 2010; 33: 1075–80.
6. Peppard PE, Young T, Palta M, Dempsey J, Skatrud J: Longitudinal study of moderate weight change and sleep-disordered breathing. JAMA 2000; 284: 3015–21.
7. Young T, Peppard PE, Taheri S: Excess weight and sleep-disordered breathing. J Appl Physiol 2005; 99: 1592–9.
8. Shahar E, Redline S, Young T, et al.: Hormone replacement therapy and sleep-disordered breathing. Am J Respir Crit Care Med 2003; 167: 1186–92.
9. Young T, Finn L, Austin D, Peterson A: Menopausal status and sleep-disordered breathing in the Wisconsin Sleep Cohort Study. Am J Respir Crit Care Med 2003; 167: 1181–5.
10. Carskadon MA, Bearpark HM, Sharkey KM, et al.: Effects of menopause and nasal occlusion on breathing during sleep. Am J Respir Crit Care Med 1997; 155: 205–10.
11. McNicholas WT, Tarlo S, Cole P, et al.: Obstructive apneas during sleep in patients with seasonal allergic rhinitis. Am Rev Respir Dis 1982; 126: 625–8.
12. Kashyap R, Hock LM, Bowman TJ: Higher prevalence of smoking in patients diagnosed as having obstructive sleep apnea. Sleep Breath 2001; 5: 167–72.
13. Wetter DW, Young TB, Bidwell TR, Badr MS, Palta M: Smoking as a risk factor for sleep-disordered breathing. Arch Intern Med 1994; 154: 2219–24.
14. Jordan AS, McSharry DG, Malhotra A. Adult obstructive sleep apnoea. Lancet 2014; 383: 736–47.
15. Mathur R, Douglas NJ: Family studies in patients with the sleep apnea-hypopnea syndrome. Ann Intern Med 1995; 122: 174–8.

16. Carmelli D, Colrain IM, Swan GE, Bliwise DL: Genetic and environmental influences in sleep-disordered breathing in older male twins. Sleep 2004; 27: 917–22.

17. Patel SR, Larkin EK, Redline S: Shared genetic basis for obstructive sleep apnea and adiposity measures. Int J Obes (Lond) 2008; 32: 795–800.

18. Chervin RD: Sleepiness, fatigue, tiredness, and lack of energy in obstructive sleep apnea. Chest 2000; 118: 372–9.

19. Kapur VK, Baldwin CM, Resnick HE, Gottlieb DJ, Nieto FJ: Sleepiness in patients with moderate to severe sleep-disordered breathing. Sleep 2005; 28: 472–7.

20. George CFP: Sleep apnea, alertness, and motor vehicle crashes. Am J Respir Crit Care Med 2007; 176: 954–6.

21. Cheshire K, Engleman H, Deary I, Shapiro C, Douglas NJ: Factors impairing daytime performance in patients with sleep apnea/hypopnea syndrome. Arch Intern Med 1992; 152: 538–41.

22. Naëgelé B, Thouvard V, Pépin JL, et al.: Deficits of cognitive executive functions in patients with sleep apnea syndrome. Sleep 1995; 18: 43–52.

23. Baldwin CM, Griffith KA, Nieto FJ, O'Connor GT, Walsleben JA, Redline S: The association of sleep-disordered breathing and sleep symptoms with quality of life in the Sleep Heart Health Study. Sleep 2001; 24: 96–105.

24. Deacon NL, Jen R, Li Y, Malhotra A: Treatment of obstructive sleep apnea. Prospects for personalized combined modality therapy. Ann Am Thorac Soc 2016; 13: 101–8.

25. Sommer JU, Heiser C, Gahleitner C, Herr RM, Hörmann K, Maurer JT, et al. Tonsillectomy with Uvulopalatopharyngoplasty in Obstructive Sleep Apnea. Dtsch Arztebl Int 2016; 113: 1–8.

26. Eichenberger M, Baumgartner S: The impact of rapid palatal expansion on children's general health: a literature review. Eur J Paediatr Dent 2014; 15: 67–71.

27. Bratton DJ, Gaisl T, Wons AM, Kohler M. CPAP vs Mandibular Advancement Devices and Blood Pressure in Patients With Obstructive Sleep Apnea: A Systematic Review and Meta-analysis. JAMA 2015; 314: 2280–93.

28. Iftikhar IH, Bittencourt L, Youngstedt SD, Ayas N, Cistulli P, Schwab R, Durkin MW, Magalang UJ. Comparative efficacy of CPAP, MADs, exercise-training, and dietary weight loss for sleep apnea: a network meta-analysis. Sleep Med 2017; 30: 7–14.

29. Hochban W, Brandenburg U, Peter JH. Surgical treatment of obstructive sleep apnea by maxillomandibular advancement. Sleep 1994; 17: 624–9.

30. Deutsche Gesellschaft für Schlafforschung und Schlafmedizin (DGSM). S3-Leitlinie Nicht erholsamer Schlaf/Schlafstörungen – Kapitel „Schlafbezogene Atmungsstörungen". Somnologie 2017; 20: S97–S180.

31. Higgins JPT, Green S, Cochrane Colloboration: Cochrane handbook for systematic reviews of interventions. http://handbook.cochrane.org/ (last accessed on 30 March 2017).

32. Liberati A, Altman DG, Tetzlaff J, et al.: The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. J Clin Epidemiol 2009; 62: e1-34.

33. Aromataris E, Fernandez R, Godfrey CM, Holly C, Khalil H, Tungpunkom P: Summarizing systematic reviews: methodological development, conduct and reporting of an umbrella review approach. Int J Evid Based Healthc 2015; 13: 132–40.

34. Flemons WW, Buysse D, Redline S, et al.: Sleep-related breathing disorders in adults. Sleep 1999; 22: 667–89.

35. Beck SE, Marcus CL: Pediatric polysomnography. Sleep Med Clin 2009; 4: 393–406.

36. Uliel S, Tauman R, Greenfeld M, Sivan Y: Normal polysomnographic respiratory values in children and adolescents. Chest 2004; 125: 872–8.

37. Papageorgiou SN, Xavier GM, Cobourne MT: Basic study design influences the results of orthodontic clinical investigations. J Clin Epidemiol 2015; 68: 1512–22.

38. Papageorgiou SN, Koretsi V, Jäger A: Bias from historical control groups used in orthodontic research: a meta-epidemiological study. Eur J Orthod 2017; 39: 98–105.

39. Guyatt GH, Oxman AD, Schünemann HJ, Tugwell P, Knottnerus A: GRADE guidelines: a new series of articles in the Journal of Clinical Epidemiology. J Clin Epidemiol 2011; 64: 380–2.

40. Shea BJ, Grimshaw JM, Wells GA, et al.: Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. BMC Med Res Methodol 2007; 7: 10.

eReferences

e1. Elbourne DR, Altman DG, Higgins JPT, Curtin F, Worthington HV, Vail A: Meta-analyses involving cross-over trials: methodological issues. Int J Epidemiol 2002; 31: 140–9.

e2. de Britto Teixeira AO, Abi-Ramia LBP, de Oliveira Almeida MA: Treatment of obstructive sleep apnea with oral appliances. Prog Orthod 2013; 14: 10.

e3. Papageorgiou SN: Meta-analysis for orthodontists: Part I--How to choose effect measure and statistical model. J Orthod 2014; 41: 317–26.

e4. Veroniki AA, Jackson D, Viechtbauer W, et al.: Methods to estimate the between-study variance and its uncertainty in meta-analysis. Res Synth Methods 2016; 7: 55–79.

e5. Higgins J, Thompson SG: Quantifying heterogeneity in a meta-analysis. Stat Med 2002; 21: 1539–58.

e6. Papageorgiou SN: Meta-analysis for orthodontists: Part II--Is all that glitters gold? J Orthod 2014; 41: 327–36.

e7. IntHout J, Ioannidis JPA, Rovers MM, Goeman JJ: Plea for routinely presenting prediction intervals in meta-analysis. BMJ Open 2016; 6: e010247.

e8. Sterne JAC, Sutton AJ, Ioannidis JPA, et al.: Recommendations for examining and interpreting funnel plot asymmetry in meta-analyses of randomised controlled trials. BMJ 2011; 343: d4002.

e9. Egger M, Davey Smith G, Schneider M, Minder C: Bias in meta-analysis detected by a simple, graphical test. BMJ 1997; 315: 629–34.

e10. Johnson VE: Revised standards for statistical evidence. Proc Natl Acad Sci U S A 2013; 110: 19313–7.

e11. Abdullatif J, Certal V, Zaghi S, et al.: Maxillary expansion and maxillomandibular expansion for adult OSA: A systematic review and meta-analysis. J Craniomaxillofac Surg 2016; 44: 574–8.

e12. Ahrens A, McGrath C, Hägg U: A systematic review of the efficacy of oral appliance design in the management of obstructive sleep apnoea. Eur J Orthod 2011; 33: 318–24.

e13. Bartolucci ML, Bortolotti F, Raffaelli E, D'Antò V, Michelotti A, Alessandri Bonetti G: The effectiveness of different mandibular advancement amounts in OSA patients: a systematic review and meta-regression analysis. Sleep Breath 2016; 20: 911–9.

e14. Bratton DJ, Gaisl T, Schlatzer C, Kohler M: Comparison of the effects of continuous positive airway pressure and mandibular advancement devices on sleepiness in patients with obstructive sleep apnoea: a network meta-analysis. Lancet Respir Med 2015; 3: 869–78.

e15. Bridgman S, Dunn K: Systematic review of the surgical treatment of obstructive sleep apnoea. J Clin Excell 2000; 1: 223–6.

e16. Caldas SGFR, Ribeiro AA, Santos-Pinto LAM dos, Martins LP, Matoso RM: Efetividade dos aparelhos intrabucais de avanço mandibular no tratamento do ronco e da síndrome da apneia e hipopneia obstrutiva do sono (SAHOS): revisão sistemática. Rev Dent Press Ortodon Ortop Facial 2009; 14: 74–82.

e17. Camacho M, Teixeira J, Abdullatif J, et al.: Maxillomandibular advancement and tracheostomy for morbidly obese obstructive sleep apnea: a systematic review and meta-analysis. Otolaryngol Head Neck Surg 2015; 152: 619–30.

e18. Caples SM, Rowley JA, Prinsell JR, et al.: Surgical modifications of the upper airway for obstructive sleep apnea in adults: a systematic review and meta-analysis. Sleep 2010; 33: 1396–407.

e19. Carvalho FR, Lentini-Oliveira D, Machado M a. C, Prado GF, Prado LBF, Saconato H: Oral appliances and functional orthopaedic appliances for obstructive sleep apnoea in children. Cochrane Database Syst Rev 2007; 10: CD005520.

e20. Carvalho FR, Lentini-Oliveira DA, Prado LB, Prado GF, Carvalho LB: Oral appliances and functional orthopaedic appliances for obstructive sleep apnoea in children. Cochrane Database Syst Rev 2016; 10: CD005520.

e21. Health Quality Ontario: Oral appliances for obstructive sleep apnea: an evidence-based analysis. Ont Health Technol Assess Ser 2009; 9: 1–51.

e22. Hoekema A, Stegenga B, De Bont LGM: Efficacy and co-morbidity of oral appliances in the treatment of obstructive sleep apnea-hypopnea: a systematic review. Crit Rev Oral Biol Med 2004; 15: 137–55.

e23. Holty J-EC, Guilleminault C: Maxillomandibular advancement for the treatment of obstructive sleep apnea: a systematic review and meta-analysis. Sleep Med Rev 2010; 14: 287–97.

e24. Hsieh Y-J, Liao Y-F: Effects of maxillomandibular advancement on the upper airway and surrounding structures in patients with obstructive sleep apnoea: a systematic review. Br J Oral Maxillofac Surg 2013; 51: 834–40.

e25. Huynh NT, Desplats E, Almeida FR: Orthodontics treatments for managing obstructive sleep apnea syndrome in children: A systematic review and meta-analysis. Sleep Med Rev 2016; 25: 84–94.

e26. Knudsen TB, Laulund AS, Ingerslev J, Homøe P, Pinholt EM: Improved apnea-hypopnea index and lowest oxygen saturation after maxillomandibular advancement with or without counterclockwise rotation in patients with obstructive sleep apnea: a meta-analysis. J Oral Maxillofac Surg 2015; 73: 719–26.

e27. Li W, Xiao L, Hu J: The comparison of CPAP and oral appliances in treatment of patients with OSA: a systematic review and meta-analysis. Respir Care 2013; 58: 1184–95.

e28. Lim J, Lasserson TJ, Fleetham J, Wright J: Oral appliances for obstructive sleep apnoea. Cochrane Database Syst Rev 2004; (4): CD004435.

e29. Machado-Júnior A-J, Zancanella E, Crespo A-N: Rapid maxillary expansion and obstructive sleep apnea: A review and meta-analysis. Med Oral Patol Oral Cir Bucal 2016; 21: e465–9.

e30. Marcus CL, Brooks LJ, Draper KA, et al.: Diagnosis and management of childhood obstructive sleep apnea syndrome. Pediatrics 2012; 130: e714–55.

e31. Marklund M, Verbraecken J, Randerath W: Non-CPAP therapies in obstructive sleep apnoea: mandibular advancement device therapy. Eur Respir J 2012; 39: 1241–7.

e32. Nazarali N, Altalibi M, Nazarali S, Major MP, Flores-Mir C, Major PW: Mandibular advancement appliances for the treatment of paediatric obstructive sleep apnea: a systematic review. Eur J Orthod 2015; 37: 618–26.

e33. Okuno K, Sato K, Arisaka T, et al.: The effect of oral appliances that advanced the mandible forward and limited mouth opening in patients with obstructive sleep apnea: a systematic review and meta-analysis of randomised controlled trials. J Oral Rehabil 2014; 41: 542–54.

e34. Pirklbauer K, Russmueller G, Stiebellehner L, et al.: Maxillomandibular advancement for treatment of obstructive sleep apnea syndrome: a systematic review. J Oral Maxillofac Surg 2011; 69: e165–76.

e35. Ramar K, Dort LC, Katz SG, et al.: Clinical Practice Guideline for the Treatment of Obstructive Sleep Apnea and Snoring with Oral Appliance Therapy: An Update for 2015. J Clin Sleep Med 2015; 11: 773–827.

e36. Serra-Torres S, Bellot-Arcís C, Montiel-Company JM, Marco-Algarra J, Almerich-Silla JM: Effectiveness of mandibular advancement appliances in treating obstructive sleep apnea syndrome: A systematic review. Laryngoscope 2016; 126: 507–14.

e37. Sharples LD, Clutterbuck-James AL, Glover MJ, et al.: Meta-analysis of randomised controlled trials of oral mandibular advancement devices and continuous positive airway pressure for obstructive sleep apnoea-hypopnoea. Sleep Med Rev 2016; 27: 108–24.

e38. Sher AE, Schechtman KB, Piccirillo JF: The efficacy of surgical modifications of the upper airway in adults with obstructive sleep apnea syndrome. Sleep 1996; 19: 156–77.

e39. Zaghi S, Holty J-EC, Certal V, et al.: Maxillomandibular Advancement for Treatment of Obstructive Sleep Apnea: A Meta-analysis. JAMA Otolaryngol Head Neck Surg 2016; 142: 58–66.

e40. Zhu Y, Long H, Jian F, et al.: The effectiveness of oral appliances for obstructive sleep apnea syndrome: A meta-analysis. J Dent 2015; 43: 1394–402.

e41. Sindhu F, Carpenter L, Seers K: Development of a tool to rate the quality assessment of randomized controlled trials using a Delphi technique. J Adv Nurs 1997; 25: 1262–8.

e42. Belbasis L, Bellou V, Evangelou E, Ioannidis JPA, Tzoulaki I: Environmental risk factors and multiple sclerosis: an umbrella review of systematic reviews and meta-analyses. Lancet Neurol 2015; 14: 263–73.

e43. Ryan CF, Love LL, Peat D, Fleetham JA, Lowe AA: Mandibular advancement oral appliance therapy for obstructive sleep apnoea: effect on awake calibre of the velopharynx. Thorax 1999; 54: 972–7.

e44. Villa MP, Bernkopf E, Pagani J, Broia V, Montesano M, Ronchetti R. Randomized controlled study of an oral jaw-positioning appliance for the treatment of obstructive sleep apnea in children with malocclusion. Am J Respir Crit Care Med 2002; 165: 123–7.

e45. Cozza P, Gatto R, Ballanti F, Prete L. Management of obstructive sleep apnoea in children with modified monobloc appliances. Eur J Paediatr Den 2004; 5: 24–9

e46. Randerath WJ, Heise M, Hinz R, Ruehle K-H: An individually adjustable oral appliance vs continuous positive airway pressure in mild-to-moderate obstructive sleep apnea syndrome. Chest 2002; 122: 569–75.

e47. Tan YK, L'Estrange PR, Luo YM, et al.: Mandibular advancement splints and continuous positive airway pressure in patients with obstructive sleep apnoea: a randomized cross-over trial. Eur J Orthod 2002; 24: 239–49.

e48. Almeida FR, Henrich N, Marra C, et al.: Patient preferences and experiences of CPAP and oral appliances for the treatment of obstructive sleep apnea: a qualitative analysis. Sleep Breath 2013; 17: 659–66.

e49. Tsilidis KK, Kasimis JC, Lopez DS, Ntzani EE, Ioannidis JPA: Type 2 diabetes and cancer: umbrella review of meta-analyses of observational studies. BMJ 2015; 350: g7607.

e50. Guilleminault C, Monteyrol PJ, Huynh NT, Pirelli P, Quo S, Li K. Adeno-tonsillectomy and rapid maxillary distraction in pre-pubertal children, a pilot study. Sleep Breath 2011; 15: 173–7.

e51. Villa MP, Rizzoli A, Miano S, Malagola C. Efficacy of rapid maxillary expansion in children with obstructive sleep apnea syndrome: 36 months of follow-up. Sleep Breath 2011; 15: 179–84.

e52. Liu SY, Guilleminault C, Huon LK, Yoon A. Distraction Osteogenesis Maxillary Expansion (DOME) for Adult Obstructive Sleep Apnea Patients with High Arched Palate. Otolaryngol Head Neck Surg 2017; 157: 345–8.

e53. Vicini C, Dallan I, Campanini A, De Vito A, Barbanti F, Giorgiomarrano G, Bosi M, Plazzi G, Provini F, Lugaresi E. Surgery vs ventilation in adult severe obstructive sleep apnea syndrome. Am J Otolaryngol 2010; 31: 14–20.

e54. Stewart L, Moher D, Shekelle P: Why prospective registration of systematic reviews makes sense. Syst Rev 2012; 1: 7.

e55. Papageorgiou PN, Deschner J, Papageorgiou SN: Effectiveness and Adverse Effects of Deep Brain Stimulation: Umbrella Review of Meta-Analyses. J Neurol Surg A Cent Eur Neurosurg 2017; 78: 180–90.

Tables

Table 1. Characteristics of included systematic reviews.

Nr.	Systematic review	Databases searched	Tx	Internal validity	Outcomes *[1]	MA	Evidence quality	Conflict of Interest
1	Abdullatif (2016) (e11)	9	ME	NICE tool	AHI, LOS	Yes	No	NR
2	Ahrens (2011) (e12)	4	OA	AASM criteria	AHI, RDI	No	No	External, non-profit
3	Bartolucci (2016) (e13)	6	OA	EPHPP tool	AHI	Yes	GRADE	None existing
4	Bratton (2015) (e14)	2	OA	Cochrane RoB	ESS	Yes	No	External / internal non-profit
5	Bridgman and Dunn (2000) (e15)	4	MMA	Jadad scale	OD	No	No	External, non-profit
6	Caldas (2009) (e16)	1	OA	Jadad scale	AHI, ESS, OD	No	No	NR
7	Camacho (2015) (e17)	4	MMA	NICE tool	AHI, RDI, ESS, LOS	Yes	No	External, non-profit
8	Caples (2010) (e18) *[2]	4	MMA	NR	AHI	Yes	GRADE	External for one author, research support from ResMed and Ventus Medical
9	Carvalho (2007, 2016) (e19, e20)	6	OA	Cochrane RoB	AHI	No	GRADE	External, non-profit
10	Health Quality Ontario (2009) (e21)	6	OA	Custom (Goodman)	AHI, ESS	Yes	GRADE	None existing
11	Hoekema (2004) (e22)	4	OA	Custom (e41)	AHI, ESS	Yes	No	External, non-profit
12	Holty and Guilleminault (2010) (e23)	1	MMA	-	AHI, ESS, LOS, SE	Yes	No	None existing
13	Hsieh and Liao (2013) (e24)	1	MMA	Jadad scale	AHI	No	No	External, non-profit
14	Huynh (2016) (e25)	4	OA, ME	ARRIVE (modif. for humans)	AHI, OS	Yes	No	None existing
15	Knudsen (2015) (e26)	2	MMA	-	AHI, LOS	Yes	No	None existing
16	Li (2013) (e27)	3	OA	Cochrane RoB	AHI, ESS, LOS	Yes	No	None existing
17	Lim (2004) (e28)	2	OA	Jadad scale	AHI, LOS	Yes	No	External, non-profit
18	Machado-Júnior (2016) (e29)	1	ME	-	AHI	Yes	No	None existing
19	Marcus (2012) (e30)	6	ME	AAN criteria	AHI	No	AAP criteria	None existing
20	Marklund (2012) (e31)	2	OA	CEBM criteria	AHI, ESS, OS	No	CEBM criteria	None existing
21	Nazarali (2015) (e32)	6	OA	Cochrane RoB	AHI, OD	No	No	NR
22	Okuno (2014) (e33)	3	OA	Cochrane RoB (modif.)	AHI, ESS	Yes	GRADE	None existing
23	Pirklbauer (2011) (e34)	1	MMA	CEBM criteria	AHI, ESS	No	No	NR
24	Ramar (2015) (e35)	2	OA	Cochrane RoB (modif.)	AHI, RDI, ESS, LOS, SE	Yes	GRADE	External for some authors, profit / non-profit
25	Serra-Torres (2016) (e36)	3	OA	CONSORT	AHI, ESS, OS	No	No	None existing
26	Sharples (2016) (e37)	3 & existed databank	OA	Jadad scale	AHI, ESS	Yes	No	None existing
27	Sher (1996) (e38)	1	MMA	-	AHI, LOS	No	No	NR
28	Zaghi (2016) (e39)	4	MMA	NR	AHI, RDI	Yes	No	None existing
29	Zhu (2015) (e40)	5	OA	Cochrane RoB	AHI, ESS, LOS, SE	Yes	GRADE	External, non-profit

AAN, American Academy of Neurology; AAP, American Academy of Pediatrics; AASM, American Academy Sleep Medicine; AHI, apnea hypopnea index; CEBM, Center for Evidence-Based Medicine in Oxford; EPHPP, Effective Public Health Practice Project; ESS, Epworth Sleepiness Scale; LOS, lowest oxygen saturation; MA, meta-analysis; ME, maxillary expansion; MMA, maxillomandibular advancement; NR, not reported; OA, oral appliance; OD, oxygen desaturation; OS, oxygen saturation; RDI, respiratory disturbance index; SE, sleep efficiency; Tx, treatment.

*[1] Only among those included in our study protocol

*[2] Data extracted only on MMA

Table 2. Results of available comparisons regarding the primary and secondary outcomes.

							Heterogeneity				Largest trial	Egger's test
	Outcome	Trials	Pat's	Effect (95% CI)	p value	Sign.	τ^2	I^2	Comment	Consistent	Effect (95% CI)	Sign.
Oral appliance versus placebo appliance												
A	AHI_{con} [*1]	12	525	MD: -11.7 (-15.38,-8.01)	<0.001	**	20.2	93.6%	High	Yes	-9.3 (-12.00, -6.60)	NS
B	ESS [*2]	11	475	MD: -1.18 (-2.38,0.03)	0.055		2.1	60.6%	Moderate	No	-2.01 (-2.70,-1.32)	NS
C	Min satur [*3]	6	286	MD: 3.33 (1.38,5.28)	0.007	*	2.2	96.8%	High	Yes	1.90 (0.51,3.29)	-
Oral appliance versus no appliance												
D	AHI_{con}	1	24	MD: -14.30 (-21.59,-7.01)	<0.001	**	-	-	-	-	Same	-
E	AHI_{bin}	1	23	RR: 0.37 (0.15,0.90)	0.029	*	-	-	-	-	Same	-
F	ESS	1	23	MD: -1.00 (-3.77,1.77)	0.479		-	-	-	-	Same	-
Oral $appliance_1$ versus oral $appliance_2$												
G	AHI	1	23	MD: -2.00 (-6.51,2.51)	0.385		-	-	-	-	Same	-
Oral $appliance_1$ versus oral $appliance_2$												
H	ESS	1	67	MD: -6.00 (-8.41,-3.59)	<0.001	**	-	-	-	-	Same	-

CI, Confidence Intervals; MD, Mean Differences; AHI, apnea hypopnea index; Min Satur, mimimum oxygen saturation; ESS, Epworth Sleepiness Scale; con, continuous; bin, binary; oral $appliance_1$, oral appliance with 4 mm opening; oral $appliance_2$, oral appliance with 14 mm opening

[*1] 95% Predictive Intervals; Estimate: -22.55,-0.85; Consistent: Yes

[*2] 95% Predictive Intervals; Estimate: -4.76,2.40; Consistent: No

[*3] 95% Predictive Intervals; Estimate: -1.62,8.28; Consistent: No

Table 3. Results on epidemiological criteria regarding the primary and secondary outcomes.

	Outcome	p<0.001	Adequate sample	Heterogeneity not a problem	PrI Consistent	Egger's test NS	Criteria met
Oral appliance versus placebo appliance							
A	AHI_{con}	Yes	Yes	Yes	Yes	Yes	Yes
B	ESS	No	No	No	No	Yes	No
C	Min satur	No	No	Yes	No	-	No
Oral appliance versus no appliance							
D	AHI_{con}	Yes	No	-	-	-	No
E	AHI_{bin}	No	No	-	-	-	No
F	ESS	No	No	-	-	-	No
Oral $appliance_1$ versus oral $appliance_2$							
G	AHI	No	No	-	-	-	No
H	ESS	Yes	No	-	-	-	No

PrI, Predictive Intervals; NS, not significant; AHI, apnea hypopnea index; Min Satur, minimum oxygen saturation; ESS, Epworth Sleepiness Scale; con, continuous; bin, binary; oral $appliance_1$, oral appliance with 4 mm opening; oral $appliance_2$, oral appliance with 14 mm opening

Figure legends

Figure 1. Diagram summarizing the pathophysiology of obstructive sleep apnea [adapted from Jordan *et al*. (14) with permission].

Figure 2. Forest plot providing an overview of included meta-analyses and their results.

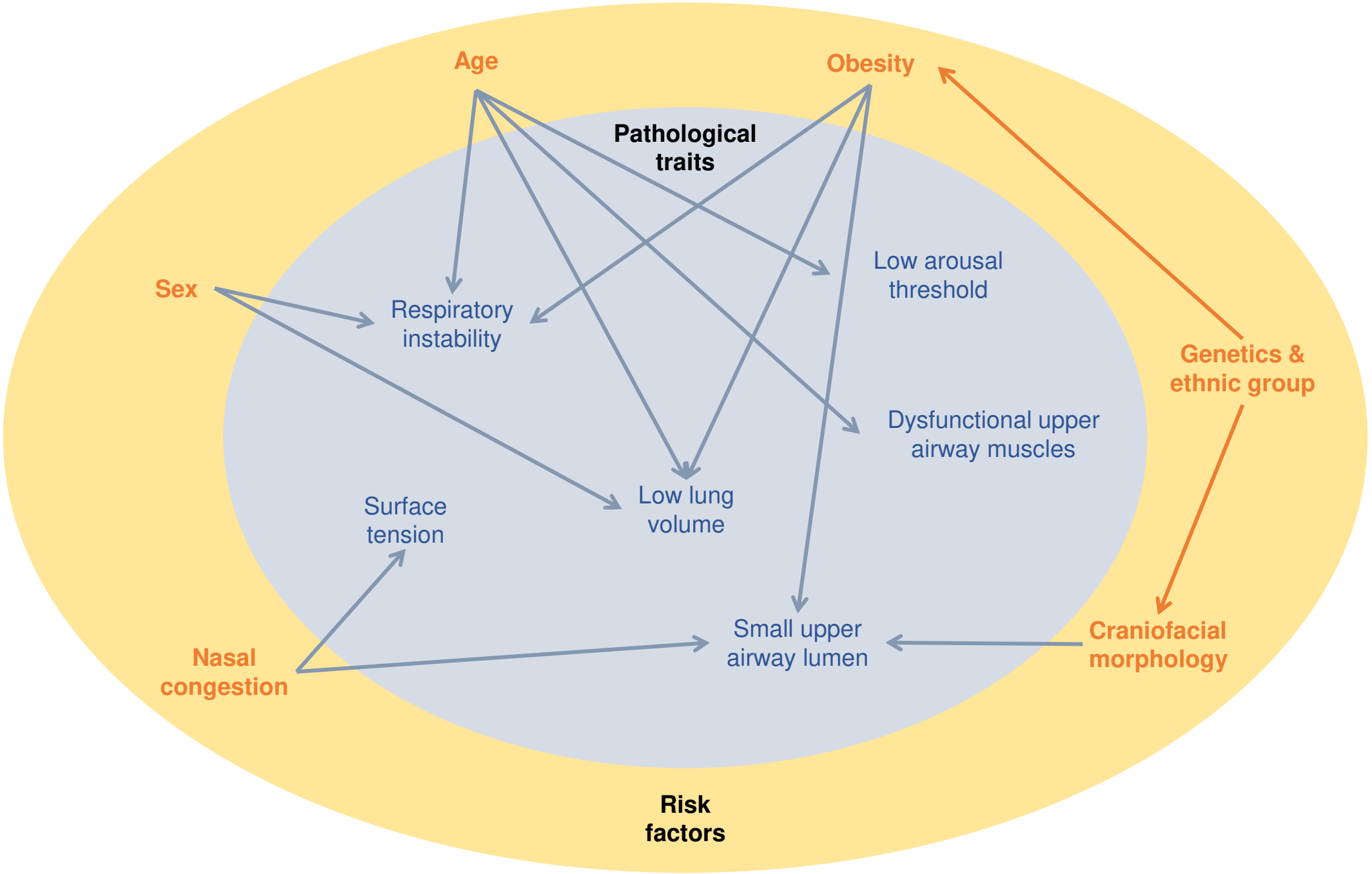
MD, Mean Differences; CI, Confidence Intervals; AHI, apnea hypopnea index; OA, oral appliances; OA_1 vs OA_2, oral appliance (4 mm opening) versus oral appliance (14 mm opening); ESS, Epworth Sleepiness Scale.

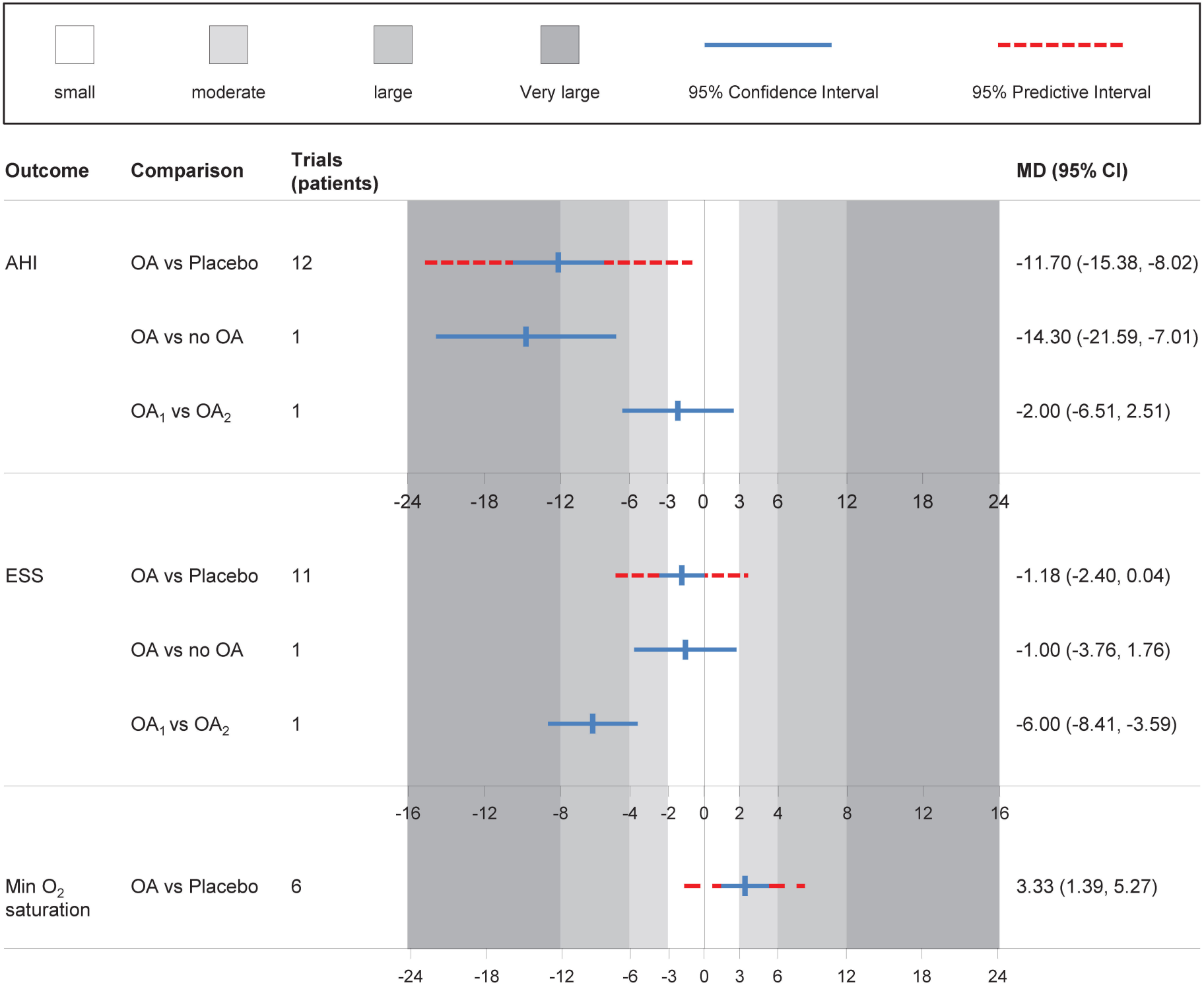
eFigure 1. Flow diagram for the selection of included studies.

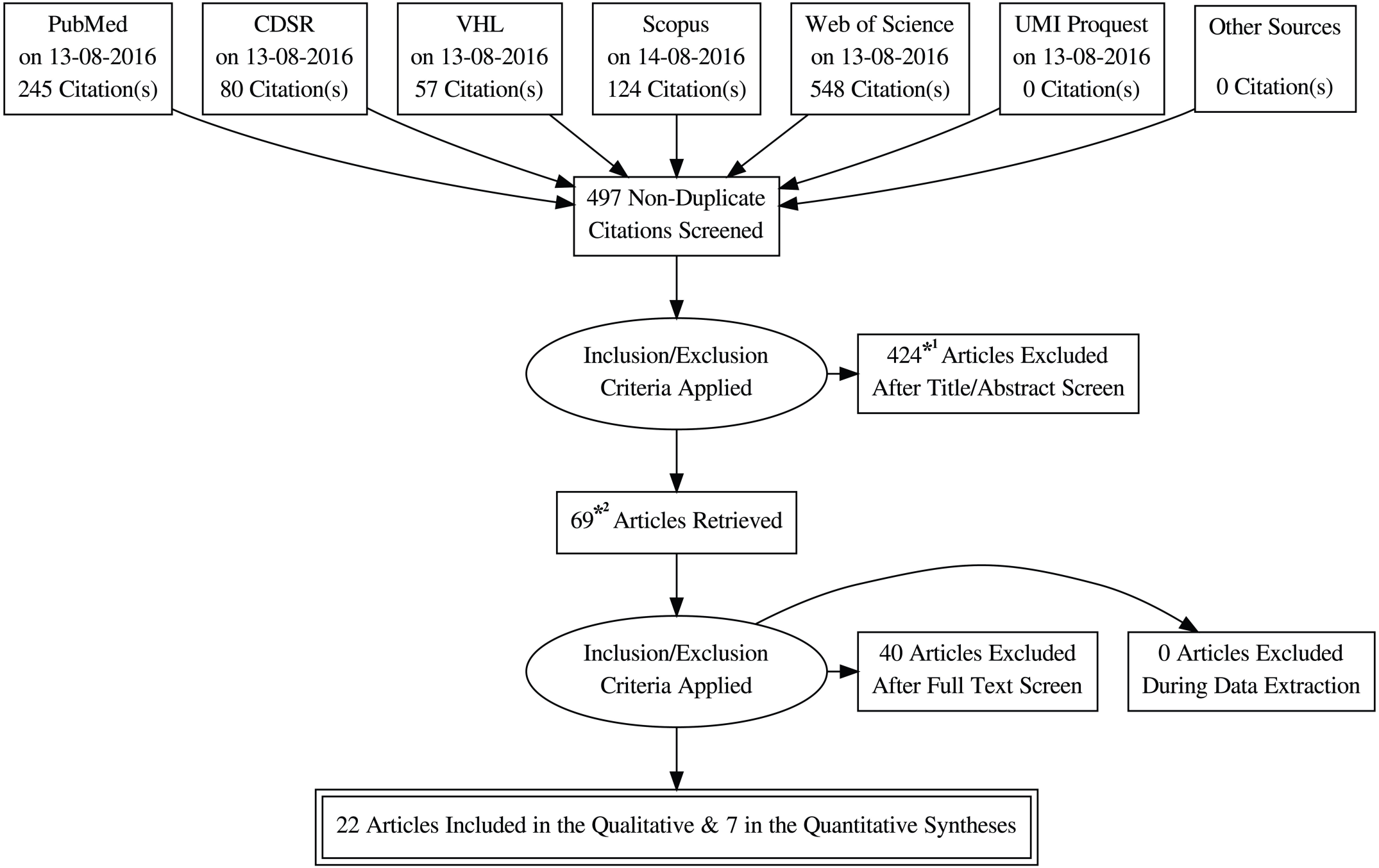
CDSR, Cochrane Database of Systematic reviews; VHL, Virtual Health Library.

*[1] Three abstracts could not be found

*[2] One full text could not be found


Age
Obesity
Pathological traits
Sex
Respiratory instability
Low arousal threshold
Genetics & ethnic group
Dysfunctional upper airway muscles
Low lung volume
Surface tension
Small upper airway lumen
Nasal congestion
Craniofacial morphology
Risk factors


small
moderate
large
Very large
95% Confidence Interval
95% Predictive Interval
Outcome
Comparison
Trials (patients)
MD (95% CI)
AHI
OA vs Placebo
12
-11.70 (-15.38, -8.02)
OA vs no OA
1
-14.30 (-21.59, -7.01)
OA1 vs OA2
1
-2.00 (-6.51, 2.51)
-24 -18 -12 -6 -3 0 3 6 12 18 24
ESS
OA vs Placebo
11
-1.18 (-2.40, 0.04)
OA vs no OA
1
-1.00 (-3.76, 1.76)
OA1 vs OA2
1
-6.00 (-8.41, -3.59)
-16 -12 -8 -4 -2 0 2 4 8 12 16
Min O2 saturation
OA vs Placebo
6
3.33 (1.39, 5.27)
-24 -18 -12 -6 -3 0 3 6 12 18 24


PubMed
on 13-08-2016
245 Citation(s)
CDSR
on 13-08-2016
80 Citation(s)
VHL
on 13-08-2016
57 Citation(s)
Scopus
on 14-08-2016
124 Citation(s)
Web of Science
on 13-08-2016
548 Citation(s)
UMI Proquest
on 13-08-2016
0 Citation(s)
Other Sources
0 Citation(s)
497 Non-Duplicate
Citations Screened
Inclusion/Exclusion
Criteria Applied
424*1 Articles Excluded
After Title/Abstract Screen
69*2 Articles Retrieved
Inclusion/Exclusion
Criteria Applied
40 Articles Excluded
After Full Text Screen
0 Articles Excluded
During Data Extraction
22 Articles Included in the Qualitative & 7 in the Quantitative Syntheses

Supplementary material

eMethods

Eligibility criteria, study identification and selection

No limitations on publication date, language, and status were applied to our searches. Additional hand searches of the reference lists of eligible articles were undertaken. Finally, two electronic databases (Google Scholar and PROSPERO) were manually searched for additional systematic reviews and / or protocols.

Eligibility of systematic reviews was assessed on the basis of title, abstract, and full-text. Authors were contacted whenever a full-text could not be found. Study identification and selection were performed by one reviewer (VK) with a subsequent independent duplicate check by a second reviewer (SNP). Conflicts were resolved by discussion (TE).

For adults, OSA was defined as having an apnea-hypopnea index of at least five episodes per hour of sleep or a respiratory disturbance index of at least five episodes per hour of sleep (34). For children, OSA was defined as having an AHI of at least one episode per hour of sleep (35, 36). Primary trials included in systematic reviews had to be randomized clinical trials or prospective non-randomized controlled trials of any clinical setting. We excluded studies with retrospective or historical experimental and control groups as they are associated with bias (37, 38).

Data extraction

From each included systematic review, we recorded if the included systematic reviews assessed the risk of bias of the individual studies and the quality of evidence according to the GRADE approach (39), but we did not perform these procedures ourselves, as this task was beyond the scope of this umbrella review of systematic reviews. Additionally, we appraised the methodological quality of the included systematic reviews with the AMSTAR tool (40).

From each eligible meta-analysis, the same two authors extracted information independently on first author, year of publication, outcome examined, number of included studies, and reported data at the individual trial level. Eligible outcomes were extracted in either continuous or binary format. In order to deal with study overlaps across included meta-analyses, the PubMed Unique Identifier (PMID)

was used to characterize each trial included in the meta-analyses and all available trials were pooled according to PMID.

After checking for design suitability and lack or proper handling by the trialists of carry-over effects (31, e1), we decided to include and combine both parallel and crossover randomized trials, approximating a paired analysis for the latter. We extracted for each outcome the absolute increment of change through treatment as final minus baseline value. In case this was not reported in the original trials, we calculated this ourselves using appropriate methods for paired data (31), using a pre-post correlation of 0.50 from existing data (e2). For crossover trials, we additionally calculated the effect size by subtracting the increment of change from baseline of each trial arm using a similar paired approach (e1) and a correlation of 0.25, again, from existing data (e2).

Assessment of summary effects and heterogeneity

A random-effects synthesis makes the assumption that individual studies are estimating different effects, which are assumed to have a normal distribution. The random-effects meta-analysis is performed to estimate the mean of this distribution of effects across different studies and the uncertainty about that mean (95% Confidence Interval (CI)). Cut-offs of half, one, and two standard deviations of the response in the control group (taken from the largest included trials) were used to augment all forest plots with contours of effect magnitude.

We assessed heterogeneity between studies by calculating both the variance among effect sizes tau^2 and the I^2 metric of inconsistency, which could reflect either genuine diversity or bias (e5). The I^2 metric ranges between 0% and 100%, and is the ratio of variance between studies over the sum of the variances within and between studies. We also assessed descriptively whether heterogeneity would influence the direction or only magnitude of effects (i.e. if meta-analysed studies lay on both sides or on only one side of the forest plot, respectively) (e6). Finally, we calculated the 95% Prediction Interval (PrI) for the summary random-effects estimates, which further accounts for heterogeneity between studies and indicates the uncertainty for the effect that would be expected in a new study examining that same association (e7). The 95% PrI shows where the true effects are for 95% of the studies from the population of studies that are synthesized or similar (exchangeable) studies that might be performed in the future.

Predefined mixed-effects subgroup analyses and random-effects meta-regressions were performed for the following factors: baseline patient characteristics (including mean age, ratio of male patients, mean AHI, mean BMI, and sample size), follow-up time, % of maximum protrusion in the construction of oral appliances (OA), appliance category (custom OA based on impressions, pre-fabricated OA, tongue suction OA), and appliance type (1- or 2-piece). Sensitivity analyses were performed to assess any systematic differences according to study design (parallel or crossover) or data calculations done for this umbrella review.

Assessment of small study effects

We examined whether there is an indication for small study effects - that is, if small studies tend to give higher estimates than large studies. Small study effects can indicate publication bias or other reporting biases, but they can also reflect genuine heterogeneity, chance, or other reasons for differences between small and large studies (e8). We used the regression asymmetry test proposed by Egger *et al.* (e9) to investigate funnel plot asymmetry in meta-analyses of at least 10 studies (e8).

Associations meeting further criteria

We further identified associations for which the random-effects estimates showed strong evidence of significance according to the following criteria: (a) $p<0.001$, a threshold that has been suggested to substantially reduce the number of false positive findings (e10), (b) associations based on adequate sample (>500 patients), (c) associations that did not have large heterogeneity between studies ($I^2<75\%$), which could affect the direction of estimates, (d) their 95% PrI excluded the null value, and (e) had no evidence of small study effects (from the Egger's test). All p values were two-sided, while statistical significance was set at 5% for all tests, except for heterogeneity and Egger's tests (10%). Although multiple p values are reported in this umbrella review, no correction or adjustment was performed, as we aimed to summarize the results of the included papers.

eBox 1

Characteristics of the included systematic reviews

- Twenty eight reviews were published in scientific journals, while one was published as a Health Technology Assessment.
- All reviews were published in English between 1996 and 2016 and searched from one to nine literature databases.
- Ten (34%) reviews included only RCTs, 7 (24%) included both RCTs and non-RCTs, and the remaining 12 (41%) only included non-RCTs.
- The majority of them (16 reviews; 55%) assessed oral appliances, 9 (31%) assessed surgical maxillomandibular advancement, 3 (10%) assessed maxillary expansion, and one assessed more than one intervention.
- Almost all of the reviews (27 reviews; 93%) reported on the primary outcome AHI, 14 (48%) reported on ESS, and 15 (52%) reported on oxygen saturation indices.
- From the included systematic reviews, 12 (41%) had no conflicts of interest, 9 (31%) declared non-profit support, 2 (7%) involved company support, and 6 (21%) did not declare any status.
- At the time of this umbrella review, 4 included reviews had not been cited, while the rest gathered in total 2980 citations in Google Scholar ® (median=21; range=1-1016)

eBox 2

Risk of bias and methodological adequacy of the included systematic reviews

- Out of the 29 included systematic reviews, 23 of them (79%) assessed the risk of bias in the included trials; seven of them (24%) with the Cochrane Collaboration's risk of bias tool.
- The quality of evidence (strength of recommendations) from the performed meta-analyses was assessed with the GRADE approach only in 7 out of 29 reviews (24%) and with other approaches in another 2 reviews (7%). The strength of recommendations of the included reviews ranged from very low to high.
- The AMSTAR scores for the included reviews ranged from 1 to 9 out of 11, with a mean score of 5 (excluding non-applicable ratings) and a standard deviation of 2, while no review scored full points.
- The main shortcomings were lack of *a priori* design (in 22 [76%] of the reviews), incomplete reporting of included / excluded studies (in 24 [83%] of the reviews), absence of grey literature searches (in 21 [72%] of the reviews), and missing statements for possible conflicts of interest (in all of the reviews).

eTable 1. Identification of studies. Databases, dates, search strategies, and hits.

Database and date searched	Search query	Hits per query	Hits per database
PubMed	((((appliance OR device OR splint*)) AND (mandib* OR "lower jaw")) AND ("obstructive sleep apnoea" OR "obstructive sleep apnea" OR OSA OR apnea OR apnoea OR snor* OR breath* OR respir* OR hypopnea OR sleep*)) Filters: Review	132	
http://www.ncbi.nlm.nih.gov/pubmed/advanced, on 13.08.2016	((((maxilla* OR palat*)) AND expansion) AND ("obstructive sleep apnoea" OR "obstructive sleep apnea" OR OSA OR apnea OR apnoea OR snor* OR breath* OR respir* OR hypopnea OR sleep*)) Filters: Review	43	**245**
	((((("maxillomandibular advancement" OR osteotomy OR BSSO OR "bilateral sagittal split osteotomy" OR "mandibular advancement" OR "Le Fort" OR "maxillary advancement"))) AND (("obstructive sleep apnoea" OR "obstructive sleep apnea" OR OSA OR apnea OR apnoea OR snor* OR breath* OR respir* OR hypopnea OR sleep*))) Filters: Meta-Analysis; Systematic Reviews	70	
Cochrane Database of Systematic Reviews	(appliance or device or splint*) and (mandib* or "lower jaw") and ("obstructive sleep apnoea" or "obstructive sleep apnea" or OSA or apnea or apnoea or snor* or breath* or respir* or hypopnea or sleep*) in Cochrane Reviews (Search all text)	46	
http://onlinelibrary.wiley.com/cochranelibrary/search, on 13.08.2016	("maxillary expansion" or "palatal expansion") and ("obstructive sleep apnoea" or "obstructive sleep apnea" or OSA or apnea or apnoea or snor* or breath* or respir* or hypopnea or sleep*) in Cochrane Reviews (Search all text)	6	**80**
	("maxillomandibular advancement" or osteotomy or BSSO or "bilateral sagittal split osteotomy" or "mandibular advancement" or "Le Fort" or "maxillary advancement") and ("obstructive sleep apnoea" or "obstructive sleep apnea" or OSA or apnea or apnoea or snor* or breath* or respir* or hypopnea or sleep*) in Cochrane Reviews (Search all text)	28	
Virtual Health Library	(tw:(appliance OR device OR splint*)) AND (tw:(mandib* OR "lower jaw")) AND (tw:("obstructive sleep apnoea" OR "obstructive sleep apnea" OR OSA OR apnea OR apnoea OR snor* OR breath* OR respir* OR hypopnea OR sleep*)) AND (tw:("systematic review" OR "meta-analysis")) in Title, abstract, subject	16	
http://pesquisa.bvsalud.org/portal/advanced/?lang=en, on 13.08.2016	(tw:("maxillary expansion" OR "palatal expansion")) AND (tw:("obstructive sleep apnoea" OR "obstructive sleep apnea" OR OSA OR apnea OR apnoea OR snor* OR breath* OR respir* OR hypopnea OR sleep*)) AND (tw:("systematic review" OR "meta-analysis")) in Title, abstract, subject	9	**57**
	(tw:("maxillomandibular advancement" OR osteotomy OR BSSO OR "bilateral sagittal split osteotomy" OR "mandibular advancement" OR "Le Fort" OR "maxillary advancement")) AND (tw:("obstructive sleep apnoea" OR "obstructive sleep apnea" OR OSA OR apnea OR apnoea OR snor* OR breath* OR respir* OR hypopnea OR sleep*)) AND (tw:("systematic review" OR "meta-analysis")) in Title, abstract, subject	32	
Scopus	(TITLE-ABS-KEY ("maxillomandibular advancement" OR osteotomy OR bsso OR "bilateral sagittal split osteotomy" OR "mandibular advancement" OR "Le Fort" OR "maxillary advancement") AND TITLE-ABS-KEY ("obstructive sleep apnoea" OR "obstructive sleep apnea" OR osa OR apnea OR apnoea OR snor* OR breath* OR respir* OR hypopnea OR sleep*) AND TITLE-ABS-KEY ("systematic review" OR "meta-analysis"))	61	
http://www.scopus.com/search/, on 14.08.2016	(TITLE-ABS-KEY (((((appliance OR device OR splint*)) AND (mandib* OR "lower jaw")) AND ("obstructive sleep apnoea" OR "obstructive sleep apnea" OR osa OR apnea OR apnoea OR snor* OR breath* OR respir* OR hypopnea OR sleep*))) AND TITLE-ABS-KEY ("systematic review" OR "meta-analysis"))	53	**124**
	(TITLE-ABS-KEY (((((maxilla* OR palat*)) AND expansion) AND ("obstructive sleep apnoea" OR "obstructive sleep apnea" OR osa OR apnea OR apnoea OR snor* OR breath* OR respir* OR hypopnea OR sleep*))) AND TITLE-ABS-KEY ("systematic review" OR "meta-analysis"))	10	
Web of Science	TOPIC: (appliance OR device OR splint*) AND TOPIC: (mandib* OR "lower jaw") AND TOPIC: ("obstructive sleep apnoea" OR "obstructive sleep apnea" OR OSA OR apnea OR apnoea OR snor* OR breath* OR respir* OR hypopnea OR sleep*) Refined by: DOCUMENT TYPES: (REVIEW) All Databases	208	
http://apps.webofknowledge.com/, on 13.08.2016	TOPIC: ("maxillary expansion" OR "palatal expansion") AND TOPIC: ("obstructive sleep apnoea" OR "obstructive sleep apnea" OR OSA OR apnea OR apnoea OR snor* OR breath* OR respir* OR hypopnea OR sleep*) Refined by: DOCUMENT TYPES: (REVIEW) All Databases	64	**548**
	TOPIC: ("maxillomandibular advancement" OR osteotomy OR BSSO OR "bilateral sagittal split osteotomy" OR "mandibular advancement" OR "Le Fort" OR "maxillary advancement") AND TOPIC: ("obstructive sleep apnoea" OR "obstructive sleep apnea" OR OSA OR apnea OR apnoea OR snor* OR breath* OR respir* OR hypopnea OR sleep*) Refined by: DOCUMENT TYPES: (REVIEW) All Databases	276	
UMI Proquest	(appliance OR device OR splint*) AND (mandib* OR "lower jaw") AND ("obstructive sleep apnoea" OR "obstructive sleep apnea" OR OSA OR apnea OR apnoea OR snor* OR breath* OR respir* OR hypopnea OR sleep*) in Dissertations & Theses / Anywhere	0	
http://search.proquest.com/advanced/reset?accountid=13478, on 13.08.2016	("maxillary expansion" OR "palatal expansion") AND ("obstructive sleep apnoea" OR "obstructive sleep apnea" OR OSA OR apnea OR apnoea OR snor* OR breath* OR respir* OR hypopnea OR sleep*) in Dissertations & Theses / Anywhere	0	**0**
	("maxillomandibular advancement" OR osteotomy OR BSSO OR "bilateral sagittal split osteotomy" OR "mandibular advancement" OR "Le Fort" OR "maxillary advancement") AND ("obstructive sleep apnoea" OR "obstructive sleep apnea" OR OSA OR apnea OR apnoea OR snor* OR breath* OR respir* OR hypopnea OR sleep*) in Dissertations & Theses / Anywhere	0	
Sum			**1054**

eTable 2. Eligibility criteria for selecting systematic reviews and primary studies.

1. Criteria for including systematic reviews (with or without meta-analysis)
Inclusion criteria
At least one database is systematically searched and
There is at least a rudimentary systematic methodology, such as: methodological quality assessment of included studies with any tool or conduction of meta-analysis or study selection or data extraction in duplicate
Exclusion criteria
Systematic reviews of animal studies, narrative reviews, and practice guidelines based on literature search
2. Criteria for selecting primary studies included in the systematic reviews
Inclusion criteria
Patients with *a priori* diagnosis of OSA (AHI ≥ 5 or RDI ≥ 5 for adults and AHI ≥ 1 for children) of any age or sex
OA, RME, SARME, and MMA to alleviate / treat OSA
Direct comparisons between two or more interventions or between patients receiving the intervention and untreated / placebo matched controls
Randomized controlled trials or prospective non-randomized clinical trials of parallel or crossover design
Any clinical setting
Primary outcome: AHI measured with polysomnography before and after the intervention
Secondary outcomes measured before and after the intervention: RDI, oximetry indices, sleep efficiency, REM sleep latency, and ESS
Exclusion criteria
Studies reporting on patients suffering from other than OSA conditions
Non-clinical studies, retrospective clinical studies, case series (less than 10 patients), and case reports

OSA, obstructive sleep apnea; AHI, apnea hypopnea index; RDI, respiratory disturbance index, OA, oral appliance; RME, rapid maxillary expansion; SARME, surgically assisted rapid maxillary expansion; MMA, maxillomandibular advancement; REM, rapid eye movement; ESS, Epworth Sleepiness Scale

eTable 3. Selection of systematic reviews.

Nr.	Citation	Exclusion based on	Reason
1	Aiello KD, Caughey WG, Nelluri B, Sharma A, Mookadam F & Mookadam M (2016): Effect of exercise training on sleep apnea: A systematic review and meta-analysis. Respiratory Medicine 116: 85–92.	title	Not relevant
2	Alessandri-Bonetti G, Ippolito DR, Bartolucci ML, D'Antò V & Incerti-Parenti S (2015): Cephalometric predictors of treatment outcome with mandibular advancement devices in adult patients with obstructive sleep apnea: a systematic review. Korean J Orthod 45: 308–321.	title	Not relevant
3	Annapurna K, Suganya S, Vasanth R & Kumar PR (2014): Prosthodontic approach to treat obstructive sleep apnea. Annals of medical and health sciences research 4: 481–6.	title	Not relevant
4	Atkeson A, Yeh SY, Malhotra A & Jelic S (2009): Endothelial Function in Obstructive Sleep Apnea. Progress in Cardiovascular Diseases 51: 351–362.	title	Not relevant
5	Attanasio R (1997): An overview of bruxism and its management. Dent Clin North Am 41: 229–241.	title	Not relevant
6	Bacher M, Linz A, Buchenau W, Arand J, Krimmel M & Poets C (2010): Treatment of Infants with Pierre Robin Sequence. Laryngo-Rhino-Otologie 89: 621–627.	title	Not relevant
7	Bagnall A-M, Jones L, Duffy S & Riemsma RP (2008): Spinal fixation surgery for acute traumatic spinal cord injury. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
8	Bellamy N, Campbell J, Welch V, Gee TL, Bourne R & Wells GA (2006): Viscosupplementation for the treatment of osteoarthritis of the knee. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
9	Bennett MH, Feldmeier J, Hampson NB, Smee R & Milross C (2016): Hyperbaric oxygen therapy for late radiation tissue injury. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
10	Benson D, Klain M, Braslow A, *et al*.. (1996): Future directions for resuscitation research .1. Advanced airway control measures. Resuscitation 32: 51–62.	title	Not relevant
11	Benumof JL (1991): Management of the difficult adult airway. With special emphasis on awake tracheal intubation. Anesthesiology 75: 1087–1110.	title	Not relevant
12	Bezak BJ, Arce KA, Jacob A & Van Ess J (2016): Orthognathic Surgery in Patients With Congenital Myopathies and Congenital Muscular Dystrophies: Case Series and Review of the Literature. Journal of Oral and Maxillofacial Surgery 74: 601–609.	title	Not relevant
13	Bierma-Zeinstra SM, Brinks A, Verhagen AP, Van Rijn RM, Koes BW & Verhaar JA (2011): Interventions for lateral hip pain (tendinopathy or bursitis). Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
14	Bilkay U, Tiftikcioglu YO & Mezili C (2010): Management of Nasal Deformity in Osteogenesis Imperfecta. Journal of Craniofacial Surgery 21: 1465–1467.	title	Not relevant
15	Bloch KE (1997): Clinical significance of snoring. Schweizerische Medizinische Wochenschrift 127: 170–175.	title	Not relevant
16	Borrie FR, Bearn DR, Innes NP & Iheozor-Ejiofor Z (2015): Interventions for the cessation of non-nutritive sucking habits in children. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
17	Brevi B, Di Blasio A, Di Blasio C, Piazza F, D'Ascanio L & Sesenna E (2015): Which cephalometric analysis for maxillo-mandibular surgery in patients with obstructive sleep apnoea syndrome? Acta Otorhinolaryngologica Italica 35: 332–337.	title	Not relevant
18	Brignardello-Petersen R, Carrasco-Labra A, Araya I, Yanine N, Cordova Jara L & Villanueva J (2015): Antibiotic prophylaxis for preventing infectious complications in orthognathic surgery. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
19	Byrne M, Chan JCY & O'Broin E (2014): Perceptions and satisfaction of aesthetic outcome following secondary cleft rhinoplasty: evaluation by patients versus health professionals. J Craniomaxillofac Surg 42: 1062–1070.	title	Not relevant
20	Camacho M, Certal V, Abdullatif J, Zaghi S, Ruoff CM, Capasso R & Kushida CA (2015): Myofunctional Therapy to Treat Obstructive Sleep Apnea: A Systematic Review and Meta-analysis. Sleep 38: 669–675.	title	Not relevant
21	Camargo IB & Van Sickels JE (2015): Surgical complications after implant placement. Dent Clin North Am 59: 57–72.	title	Not relevant
22	Camirand A, Doucet J & Harris J (2004): Nose surgery: How to prevent a middle vault collapse - A review of 50 patients 3 to 21 years after surgery. Plastic and Reconstructive Surgery 114: 527–534.	title	Not relevant
23	Caruso L, Barone G, Farneti A & Caraffa A (2014): Pedicle subtraction osteotomy for the treatment of chin-on-chest deformity in a post-radiotherapy dropped head syndrome: a case report and review of literature. European Spine Journal 23: S634–S643.	title	Not relevant
24	Carvalho AP, Vital FM & Soares BG (2012): Exercise interventions for shoulder dysfunction in patients treated for head and neck cancer. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
25	Castrillon EE, Ou K-L, Wang K, Zhang J, Zhou X & Svensson P (2016): Sleep bruxism: an updated review of an old problem. Acta Odontologica Scandinavica 74: 328–334.	title	Not relevant
26	Ceccato F, Bernkopf E & Scaroni C (2015): Sleep apnea syndrome in endocrine clinics. Journal of Endocrinological Investigation 38: 827–834.	title	Not relevant
27	Cedin AC, Atallah ÁN, Andriolo RB, Cruz OL & Pignatari SN (2012): Surgery for congenital choanal atresia. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
28	Chambers HG. Advances in cerebral palsy. Current Opinion in Orthopaedics. 2002;13(6):424-31.	title	Not relevant
29	Chan E-Y, Fransen M, Parker DA, Assam PN & Chua N (2014): Femoral nerve blocks for acute postoperative pain after knee replacement surgery. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
30	Chan KK, Glenny A-M, Weldon JC, Furness S, Worthington HV & Wakeford H (2015): Interventions for the treatment of oral and oropharyngeal cancers: targeted therapy and immunotherapy. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
31	Chate R (1994): The Burden of Proof - a Critical-Review of Orthodontic Claims Made by Some General-Practitioners. American Journal of Orthodontics and Dentofacial Orthopedics 106: 96–105.	title	Not relevant
32	Christovam IO, Lisboa CO, Ferreira DMTP, Cury-Saramago AA & Mattos CT (2016): Upper airway dimensions in	title	Not relevant

	patients undergoing orthognathic surgery: a systematic review and meta-analysis. International Journal of Oral and Maxillofacial Surgery 45: 460–471.		
33	Coghlan JA, Buchbinder R, Green S, Johnston RV & Bell SN (2008): Surgery for rotator cuff disease. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
34	Cohen system. review, Burstein FD & Williams JK (1999): The role of distraction osteogenesis in the management of craniofacial disorders. Ann Acad Med Singap 28: 728–738.	title	Not relevant
35	Coppola C & Maffulli N (1999): Limb shortening for the management of leg length discrepancy. J R Coll Surg Edinb 44: 46–54.	title	Not relevant
36	Culebras A (2007): Cerebrovascular disease and the pathophysiology of obstructive sleep apnea. Current Neurology and Neuroscience Reports 7: 173–179.	title	Not relevant
37	Dao TT & Lavigne GJ (1998): Oral splints: the crutches for temporomandibular disorders and bruxism? Crit Rev Oral Biol Med 9: 345–361.	title	Not relevant
38	De Backer JW, Vos WG, Verhulst SL & De Backer W (2008): Novel imaging techniques using computer methods for the evaluation of the upper airway in patients with sleep-disordered breathing: A comprehensive review. Sleep Medicine Reviews 12: 437–447.	title	Not relevant
39	de Beer D & Bingham R (2011): The child with facial abnormalities. Curr Opin Anaesthesiol 24: 282–288.	title	Not relevant
40	de Oliveira Carvalho PE, da Silva MVM, Rodrigues OR & Cataneo AJM (2014): Surgical interventions for treating pectus excavatum. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
41	de Souza RF, Lovato da Silva CH, Nasser M, Fedorowicz Z & Al-Muharraqi MA (2012): Interventions for the management of temporomandibular joint osteoarthritis. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
42	de Souza RF, Travess H, Newton T & Marchesan MA (2015): Interventions for treating traumatised ankylosed permanent front teeth. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
43	Delaire J (1997): Maxillary development revisited: Relevance to the orthopaedic treatment of Class III malocclusions. European Journal of Orthodontics 19: 289–311.	title	Not relevant
44	Denolf PL, Vanderveken OM, Marklund ME & Braem MJ (2016): The status of cephalometry in the prediction of non-CPAP treatment outcome in obstructive sleep apnea patients. Sleep Med Rev 27: 56–73.	title	Not relevant
45	Derry CJ, Derry S & Moore RA (2014): Caffeine as an analgesic adjuvant for acute pain in adults. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
46	Douglas N (1988): Respiratory Events During Sleep Amiens - 19th-20th November, 1987. European Respiratory Journal 1: 473–475.	title	Not relevant
47	Dunn AL, Buffa EA, Hanshaw DM & Farrell M (2012): Osteosarcoma at the site of titanium orthopaedic implants in a dog. Australian Veterinary Journal 90: 39–43.	title	Not relevant
48	El-Angbawi A, McIntyre GT, Fleming PS & Bearn DR (2015): Non-surgical adjunctive interventions for accelerating tooth movement in patients undergoing fixed orthodontic treatment. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
49	El-Bialy T & Alhadlaq A (2013): New Therapeutics in Promoting and Modulating Mandibular Growth in Cases with Mandibular Hypoplasia. Biomed Research International 789679.	title	Not relevant
50	El-Orbany M & Woehlck HJ (2009): Difficult mask ventilation. Anesth Analg 109: 1870–1880.	title	Not relevant
51	Figueroa AA, Polley JW, Friede H & Ko EW (2004): Long-term skeletal stability after maxillary advancement with distraction osteogenesis using a rigid external distraction device in cleft maxillary deformities. Plastic and Reconstructive Surgery 114: 1382–1392.	title	Not relevant
52	Fleury B (2006): [Which mandibular advancement splint should be chosen and how should effective advancement be defined?]. Rev Mal Respir 23 Spec No 2: 7S55-57S57.	title	Not relevant
53	Flores-Mir C, Korayem M, Heo G, Witmans M, Major MP & Major PW (2013): SYSTEMATIC REVIEW Craniofacial morphological characteristics in children with obstructive sleep apnea syndrome A systematic review and meta-analysis. Journal of the American Dental Association 144: 269–277.	title	Not relevant
54	Fonkalsystem. reviewud EW (2003): Current management of pectus excavatum. World Journal of Surgery 27: 502–508.	title	Not relevant
55	Friedlander AH, Walker LA, Friedlander IK & Felsenfeld AL (2000): Diagnosing and comanaging patients with obstructive sleep apnea syndrome. J Am Dent Assoc 131: 1178–1184.	title	Not relevant
56	Fu K-MG, Smith JS, Polly DW, *et al.*. (2011): Morbidity and mortality associated with spinal surgery in children: a review of the Scoliosis Research Society morbidity and mortality database. J Neurosurg Pediatr 7: 37–41.	title	Not relevant
57	Furness S, Glenny A-M, Worthington HV, *et al.*. (2011): Interventions for the treatment of oral cavity and oropharyngeal cancer: chemotherapy. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
58	Gami AS, Caples SM & Somers VK (2003): Obesity and obstructive sleep apnea. Endocrinology and Metabolism Clinics of North America 32: 869–+.	title	Not relevant
59	Gelb ML (2014): Airway centric TMJ philosophy. Journal of the California Dental Association 42: 551-62–2.	title	Not relevant
60	Giles TL, Lasserson TJ, Smith B, White J, Wright JJ & Cates CJ (2006): Continuous positive airways pressure for obstructive sleep apnoea in adults. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
61	Glassman B & Gonzalez B (2005): The role of the dentist in the therapeutic support of sleep apnea. Int J Orthod Milwaukee 16: 31–35.	title	Not relevant
62	Goga D, Fassio E, Bonin B, Durand JL & Sirinelli D (1998): [Congenital stenosis of the piriform aperture: a cause of respiratory distress in newborn infants. Review of the literature, from 2 cases]. Rev Stomatol Chir Maxillofac 99: 203–206.	title	Not relevant
63	Gola G, Masini M, Purro C & De Martini S (1984): [Biological fundamentals and general therapeutic ideas on transverse expansion of the upper jaw (panoramic literature review on the state of the art)]. Parodontol Stomatol (Nuova) 23: 133–140.	title	Not relevant
64	Gola R, Cheynet F & Guyot L (2002): [Ophthalmic manifestations of nasal obstruction]. J Fr Ophtalmol 25: 319–332.	title	Not relevant
65	Gola R, Guyot L, Richard O & Layoun W (2002): [Look and nasal ventilation]. Ann Chir Plast Esthet 47: 316–328.	title	Not relevant

66	Goode RL (2007): Success and failure in treatment of sleep apnea patients. Otolaryngologic Clinics of North America 40: 891–+.	title	Not relevant
67	Gordon JM, Rosenblatt M, Witmans M, Carey JP, Heo G, Major PW & Flores-Mir C (2009): Rapid Palatal Expansion Effects on Nasal Airway Dimensions as Measured by Acoustic Rhinometry A Systematic Review. Angle Orthodontist 79: 1000–1007.	title	Not relevant
68	Greci V, Vernia E & Mortellaro CM (2014): Per-endoscopic trans-tympanic traction for the management of feline aural inflammatory polyps: a case review of 37 cats. Journal of Feline Medicine and Surgery 16: 645–650.	title	Not relevant
69	Grimm SE, Thomas GP & White MJ (1997): CHARGE syndrome: review of literature and report of case. Coloboma, heart disease, atresia of choanae, retarded mental development, genital hypoplasia, ear abnormalities-deafness. ASDC J Dent Child 64: 218–221, 228.	title	Not relevant
70	Gripp L, Hüsgen W, Luhr HG, Merten HA & Wiese G (1997): Hemifacial microsomia: extraoral appliance for the early treatment of an infant. Literature review and case report. J Orofac Orthop 58: 352–360.	title	Not relevant
71	Gross A, Langevin P, Burnie SJ, *et al*.. (2015): Manipulation and mobilisation for neck pain contrasted against an inactive control or another active treatment. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
72	Grusovin MG, Coulthard P, Worthington HV, George P & Esposito M (2010): Interventions for replacing missing teeth: maintaining and recovering soft tissue health around dental implants. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
73	Guaita M & Hoegl B (2016): Current Treatments of Bruxism. Current Treatment Options in Neurology 18: 10.	title	Not relevant
74	Guarda-Nardini L, Manfredini D, Mion M, Heir G & Marchese-Ragona R (2015): Anatomically Based Outcome Predictors of Treatment for Obstructive Sleep Apnea with Intraoral Splint Devices: A Systematic Review of Cephalometric Studies. J Clin Sleep Med 11: 1327–1334.	title	Not relevant
75	Gubisch W (2015): Treatment of the Scoliotic Nose with Extracorporeal Septoplasty. Facial Plastic Surgery Clinics of North America 23: 11–+.	title	Not relevant
76	Guijarro-Martinez R & Swennen GRJ (2011): Cone-beam computerized tomography imaging and analysis of the upper airway: a systematic review of the literature. International Journal of Oral and Maxillofacial Surgery 40: 1227–1237.	title	Not relevant
77	Gupta RK, Jadhav V, Gupta A, Sanghvi B, Shah H & Parelkar S (2008): Congenital alveolar fusion. Journal of Pediatric Surgery 43: 1421–1425.	title	Not relevant
78	Handoll HH & Brorson S (2015): Interventions for treating proximal humeral fractures in adults. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
79	Hasnat MJ & Rice JE (2015): Intrathecal baclofen for treating spasticity in children with cerebral palsy. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
80	Henry DA, Carless PA, Moxey AJ, O'Connell D, Stokes BJ, Fergusson DA & Ker K (2011): Anti-fibrinolytic use for minimising perioperative allogeneic blood transfusion. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
81	Hessemer V (1994): [Peribulbar anesthesia versus retrobulbar anesthesia with facial nerve block. Techniques, local anesthetics and additives, akinesia and sensory block, complications]. Klin Monbl Augenheilkd 204: 75–89.	title	Not relevant
82	Hopper RA (2012): New trends in cranio-orbital and midface distraction for craniofacial dysostosis. Curr Opin Otolaryngol Head Neck Surg 20: 298–303.	title	Not relevant
83	Hounsome J, Nicholson A, Greenhalgh J, Cook TM, Smith AF & Lewis system. review (2016): Nitrous oxide-based versus nitrous oxide-free general anaesthesia and accidental awareness during general anaesthesia in surgical patients. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
84	Hunter AGW, Bankier A, Rogers JG, Sillence D & Scott CI (1998): Medical complications of achondroplasia: a multicentre patient review. Journal of Medical Genetics 35: 705–712.	title	Not relevant
85	Huynh NT, Emami E, Helman JI & Chervin RD (2014): Interactions between sleep disorders and oral diseases. Oral Diseases 20: 236–245.	title	Not relevant
86	Huynh NT, Rompré PH, Montplaisir JY, Manzini C, Okura K & Lavigne GJ (2006): Comparison of various treatments for sleep bruxism using determinants of number needed to treat and effect size. Int J Prosthodont 19: 435–441.	title	Not relevant
87	Iida H (2010): Surgical repair of pectus excavatum. General thoracic and cardiovascular surgery 58: 55–61.	title	Not relevant
88	Infosino A (2002): Pediatric upper airway and congenital anomalies. Anesthesiol Clin North America 20: 747–766.	title	Not relevant
89	Iwasaki T & Yamasaki Y (2014): Relation between maxillofacial form and respiratory disorders in children. Sleep and Biological Rhythms 12: 2–11.	title	Not relevant
90	Izadpanah A, Sinno H, Laberge J-M, Michael Davis G & Lessard L (2011): Autogenous bone graft for expansion thoracoplasty in Adam Robert Wright syndrome: a case report and review. J Plast Reconstr Aesthet Surg 64: 329–334.	title	Not relevant
91	Jagger R (2008): The effectiveness of occlusal splints for sleep bruxism. Evid Based Dent 9: 23.	title	Not relevant
92	Jain AK, Dhammi IK, Jain S & Mishra P (2010): Kyphosis in spinal tuberculosis - Prevention and correction. Indian Journal of Orthopaedics 44: 127–136.	title	Not relevant
93	Jambi S, Thiruvenkatachari B, O'Brien KD & Walsh T (2013): Orthodontic treatment for distalising upper first molars in children and adolescents. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
94	Jambi S, Walsh T, Sandler J, Benson PE, Skeggs RM & O'Brien KD (2014): Reinforcement of anchorage during orthodontic brace treatment with implants or other surgical methods. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
95	Jefferson Y (2010): Mouth breathing: adverse effects on facial growth, health, academics, and behavior. Gen Dent 58: 18-25-27, 79–80.	title	Not relevant
96	Jones SF & Brito V (2014): Noncontinuous Positive Airway Pressure Therapies for Obstructive Sleep Apnea. Seminars in Respiratory and Critical Care Medicine 35: 613–620.	title	Not relevant
97	Joosten SA, O'Driscoll DM, Berger PJ & Hamilton GS (2014): Supine position related obstructive sleep apnea in adults: Pathogenesis and treatment. Sleep Medicine Reviews 18: 7–17.	title	Not relevant

98	Kaditis A, Kheirandish-Gozal L & Gozal D (2012): Algorithm for the diagnosis and treatment of pediatric OSA: A proposal of two pediatric sleep centers. Sleep Medicine 13: 217–227.	title	Not relevant
99	Kamata S (1996): [Recent advance in head and neck cancer surgery]. Gan To Kagaku Ryoho 23: 265–270.	title	Not relevant
100	Kanaya A, Yasuda T, Kojima A, Saishu T & Kurosawa S (2011): [Airway management in a patient with Williams syndrome]. Masui 60: 1176–1179.	title	Not relevant
101	Katalinic OM, Harvey LA, Herbert RD, Moseley AM, Lannin NA & Schurr K (2010): Stretch for the treatment and prevention of contractures. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
102	Kato A, Hulse KE, Tan BK & Schleimer RP (2013): B-lymphocyte lineage cells and the respiratory system. J Allergy Clin Immunol 131: 933–957; quiz 958.	title	Not relevant
103	Kato T, Yamaguchi T, Okura K, Abe S & Lavigne GJ (2013): Sleep less and bite more: Sleep disorders associated with occlusal loads during sleep. Journal of Prosthodontic Research 57: 69–81.	title	Not relevant
104	Katyal V, Pamula Y, Martin AJ, Daynes CN, Kennedy JD & Sampson WJ (2013): Craniofacial and upper airway morphology in pediatric sleep-disordered breathing: Systematic review and meta-analysis. American Journal of Orthodontics and Dentofacial Orthopedics 143: 20-U204.	title	Not relevant
105	Katz ES, Mitchell RB & D'Ambrosio CM (2012): Obstructive Sleep Apnea in Infants. American Journal of Respiratory and Critical Care Medicine 185: 805–816.	title	Not relevant
106	Khamashta-Ledezma L & Naini FB (2014): Systematic review of changes in maxillary incisor exposure and upper lip position with Le Fort I type osteotomies with or without cinch sutures and/or VY closures. International Journal of Oral and Maxillofacial Surgery 43: 46–61.	title	Not relevant
107	Klasser GD & Greene CS (2009): Oral appliances in the management of temporomandibular disorders. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 107: 212–223.	title	Not relevant
108	Kleber C, Becker CA, Malysch T, Reinhold JM, Tsitsilonis S, Duda GN, *et al.*. Temporal profile of inflammatory response to fracture and hemorrhagic shock: Proposal of a novel long-term survival murine multiple trauma model. Journal of Orthopaedic Research. 2015;33(7):965-70.	title	Not relevant
109	Kochel J, Meyer-Marcotty P, Wirbelauer J, *et al.*. (2011): Treatment modalities of infants with upper airway obstruction--review of the literature and presentation of novel orthopedic appliances. Cleft Palate Craniofac J 48: 44–55.	title	Not relevant
110	Koenig SM (2001): Pulmonary complications of obesity. American Journal of the Medical Sciences 321: 249–279.	title	Not relevant
111	Koyano K, Tsukiyama Y & Kuwatsuru R (2012): Rehabilitation of occlusion - science or art? Journal of Oral Rehabilitation 39: 513–521.	title	Not relevant
112	Koyano K, Tsukiyama Y, Ichiki R & Kuwata T (2008): Assessment of bruxism in the clinic. Journal of Oral Rehabilitation 35: 495–508.	title	Not relevant
113	Kudnig ST (2002): Nasopharyngeal polyps in cats. Clinical Techniques in Small Animal Practice 17: 174–177.	title	Not relevant
114	Lafferty PM, Anavian J, Will RE & Cole PA (2011): Operative Treatment of Chest Wall Injuries: Indications, Technique, and Outcomes. Journal of Bone and Joint Surgery-American Volume 93A: 97–110.	title	Not relevant
115	Larsen AJ, Rindal DB, Hatch JP, Kane S, Asche SE, Carvalho C & Rugh J (2015): Evidence Supports No Relationship between Obstructive Sleep Apnea and Premolar Extraction: An Electronic Health Records Review. Journal of Clinical Sleep Medicine 11: 1443–1448.	title	Not relevant
116	Laupattarakasem W, Laopaiboon M, Laupattarakasem P & Sumananont C (2008): Arthroscopic debridement for knee osteoarthritis. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
117	Leite FM, Atallah ÁN, El Dib RP, Grossmann E, Januzzi E, Andriolo RB & da Silva EM (2009): Cyclobenzaprine for the treatment of myofascial pain in adults. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
118	Lemyre B, Davis PG & De Paoli AG (2002): Nasal intermittent positive pressure ventilation (NIPPV) versus nasal continuous positive airway pressure (NCPAP) for apnea of prematurity. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
119	Lentini-Oliveira DA, Carvalho FR, Rodrigues CG, *et al.*. (2014): Orthodontic and orthopaedic treatment for anterior open bite in children. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
120	Leonardi-Bee J, Batta K, O'Brien C & Bath-Hextall FJ (2011): Interventions for infantile haemangiomas (strawberry birthmarks) of the skin. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
121	Lewis system. review, Price A, Walker KJ, McGrattan K & Smith AF (2015): Ultrasound guidance for upper and lower limb blocks. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
122	Li M, Quanying H, Yinna W, Birong D & Jinhan H (2014): High prevalence of obstructive sleep apnea in Marfan's syndrome. Chinese Medical Journal 127: 3150–3155.	title	Not relevant
123	Littlewood SJ, Millett DT, Doubleday B, Bearn DR & Worthington HV (2016): Retention procedures for stabilising tooth position after treatment with orthodontic braces. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
124	Liu JC & Shah JP (2010): Surgical technique refinements in head and neck oncologic surgery. J Surg Oncol 101: 661–668.	title	Not relevant
125	Lourenço-Matharu L, Ashley PF & Furness S (2012): Sedation of children undergoing dental treatment. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
126	Lowe A (1990): The Tongue and Airway. Otolaryngologic Clinics of North America 23: 677–698.	title	Not relevant
127	Lui MM-S, Lam DC-L & Ip MS-M (2013): Significance of endothelial dysfunction in sleep-related breathing disorder. Respirology 18: 39–46.	title	Not relevant
128	Lundqvist S (1993): Speech and other oral functions. Clinical and experimental studies with special reference to maxillary rehabilitation on osseointegrated implants. Swed Dent J Suppl 91: 1–39.	title	Not relevant
129	Lygidakis NN, Chatzidimitriou K, Petrou N & Lygidakis NA (2013): Solitary median maxillary central incisor syndrome (SMMCI) with congenital nasal puriform aperture stenosis: literature review and case report with comprehensive dental treatment and 14 years follow-up. Eur Arch Paediatr Dent 14: 417–423.	title	Not relevant
130	Lyle KC (2000): Airway compromise and dentofacial abnormalities. J Gen Orthod 11: 9–18.	title	Not relevant

131	M'saad S, Yangui I, Feki W, Abid N, Bahloul N, Marouen F, Chakroun A & Kammoun S (2015): The syndrome of increased upper airways resistance: What are the clinical features and diagnostic procedures? Revue Des Maladies Respiratoires 32: 1002–1015.	title	Not relevant
132	Macedo CR, Macedo EC, Torloni MR, Silva AB & Prado GF (2014): Pharmacotherapy for sleep bruxism. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
133	Macedo CR, Silva AB, Machado MA, Saconato H & Prado GF (2007): Occlusal splints for treating sleep bruxism (tooth grinding). Cochrane Database of Systematic Reviews CD005514.	title	Not relevant
134	Machado, Eduardo; Machado, Patricia; Cunali, Paulo Afonso; Dal Fabbro, Cibele. - Bruxismo do sono: possibilidades terapêuticas baseadas em evidências - Sleep bruxism: therapeutic possibilities based in evidences - Dental Press J Orthod;16(2): 58-64, abr. 2011. graf	title	Not relevant
135	Magdaleno F & Ginestal E (2010): Side effects of stabilization occlusal splints: a report of three cases and literature review. Cranio 28: 128–135.	title	Not relevant
136	Manfredini D, Ahlberg J, Winocur E & Lobbezoo F (2015): Management of sleep bruxism in adults: a qualitative systematic literature review. J Oral Rehabil 42: 862–874.	title	Not relevant
137	Masing H (1970): [Progress in the field of surgery of the external and inner nose in the last 10 years]. Hno 18: 329–36.	title	Not relevant
138	Mason M, Cates CJ & Smith I (2015): Effects of opioid, hypnotic and sedating medications on sleep-disordered breathing in adults with obstructive sleep apnoea. Cochrane Database of Systematic Reviews CD011090.	title	Not relevant
139	Mason M, Welsh EJ & Smith I (2013): Drug therapy for obstructive sleep apnoea in adults. Cochrane Database of Systematic Reviews CD003002.	title	Not relevant
140	Mauhourat S & Raberin M (2001): [Surgical and functional therapies of disorders of muscular equilibrium]. L' Orthodontie francaise 72: 107–20, 199–213.	title	Not relevant
141	Mayer P, Heinzer R & Lavigne G (2016): Sleep Bruxism in Respiratory Medicine Practice. Chest 149: 262–271.	title	Not relevant
142	McIntosh CG, Tonkin SL & Gunn AJ (2009): What is the mechanism of sudden infant deaths associated with co-sleeping? N Z Med J 122: 69–75.	title	Not relevant
143	McNicol ED, Ferguson MC, Haroutounian S, Carr DB & Schumann R (2016): Single dose intravenous paracetamol or intravenous propacetamol for postoperative pain. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
144	Merrill RL (2012): Temporomandibular disorder pain and dental treatment of obstructive sleep apnea. Dent Clin North Am 56: 415–431.	title	Not relevant
145	Millett DT, Cunningham S, O'Brien KD, Benson PE, Williams A & de Oliveira CM (2006): Orthodontic treatment for deep bite and retroclined upper front teeth in children. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
146	Minami-Sugaya H, Lentini-Oliveira DA, Carvalho FR, Machado MAC, Marzola C, Saconato H & Prado GF (2012): Treatments for adults with prominent lower front teeth. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
147	Mo L, He Q, Wang Y, Dong B & He J (2014): High prevalence of obstructive sleep apnea in Marfan's syndrome. Chin Med J 127: 3150–3155.	title	Not relevant
148	Moragas JSM, Van Cauteren W & Mommaerts MY (2014): A systematic review on soft-to-hard tissue ratios in orthognathic surgery part I: Maxillary repositioning osteotomy. Journal of Cranio-Maxillofacial Surgery 42: 1341–1351.	title	Not relevant
149	Morgan AT, Dodrill P & Ward EC (2012): Interventions for oropharyngeal dysphagia in children with neurological impairment. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
150	Mummaneni PV, Deutsch H & Mummaneni VP (2006): Cervicothoracic kyphosis. Neurosurgery Clinics of North America 17: 277–+.	title	Not relevant
151	Muntz HR (2012): Management of sleep apnea in the cleft population. Current Opinion in Otolaryngology & Head and Neck Surgery 20: 518–521.	title	Not relevant
152	Nathan ST, Puno RM, Serafica Paiso JM & Kawakami N (2011): A rare case of anterior thoracic myelomeningocele with scoliosis-case report and review of the literature. Spine Journal 11: E16–E22.	title	Not relevant
153	Pachikara N & Mehra R (2011): Treating Obstructive Sleep Apnea With Positive Pressure Therapy. Current Treatment Options in Neurology 13: 458–472.	title	Not relevant
154	Paley D (1990): Problems, Obstacles, and Complications of Limb Lengthening by the Ilizarov Technique. Clinical Orthopaedics and Related Research 81–104.	title	Not relevant
155	Parker MJ & Handoll HH (2009): Osteotomy, compression and other modifications of surgical techniques for internal fixation of extracapsular hip fractures. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
156	Parker MJ & Handoll HH (2010): Gamma and other cephalocondylic intramedullary nails versus extramedullary implants for extracapsular hip fractures in adults. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
157	Parker MJ, Gurusamy KS & Azegami S (2010): Arthroplasties (with and without bone cement) for proximal femoral fractures in adults. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
158	Pellan P (2005): Naso-respiratory impairment and development of dento-skeletal sequelae: a comprehensive review. Int J Orthod Milwaukee 16: 9–12.	title	Not relevant
159	Pépin JL, Bettega G, Orliaguet O, Raphaël B & Lévy P (2002): [Tools available for the diagnosis of obstructive sleep apnea syndrome. Measurements for the evaluation of therapeutic efficacy]. Rev Stomatol Chir Maxillofac 103: 151–157.	title	Not relevant
160	Pollock A, Baer G, Campbell P, Choo PL, Forster A, Morris J, Pomeroy VM & Langhorne P (2014): Physical rehabilitation approaches for the recovery of function and mobility following stroke. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
161	Poorsattar-Bejeh Mir K; Poorsattar-Bejeh Mir A; Poorsattar-Bejeh Mir M; Moradi-Lakeh M; Balmeh P; Nosystem. reviewati K. - Rapid Palatal Expansion to Treat Nocturnal Enuretic Children: a Systematic Review and Meta-	title	Not relevant

	Analysis. - J Dent (Shiraz);16(3): 138-48, 2015 Sep.		
162	Posnick JC & Agnihotri N (2010): Consequences and management of nasal airway obstruction in the dentofacial deformity patient. Curr Opin Otolaryngol Head Neck Surg 18: 323–331.	title	Not relevant
163	Povitz M, Bolo CE, Heitman SJ, Tsai WH, Wang J & James MT (2014): Effect of treatment of obstructive sleep apnea on depressive symptoms: systematic review and meta-analysis. PLoS Med 11: e1001762.	title	Not relevant
164	Powell R, Scott NW, Manyande A, *et al.*. (2016): Psychological preparation and postoperative outcomes for adults undergoing surgery under general anaesthesia. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
165	Prashanti E, Sumanth KN, Renjith George P, Karanth L & Soe HHK (2015): Management of gag reflex for patients undergoing dental treatment. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
166	Principato JJ (1991): Upper airway obstruction and craniofacial morphology. Otolaryngol Head Neck Surg 104: 881–890.	title	Not relevant
167	Qaseem A, Holty J-EC, Owens DK, Dallas P, Starkey M, Shekelle P & Clinical Guidelines Committee of the American College of Physicians (2013): Management of obstructive sleep apnea in adults: A clinical practice guideline from the American College of Physicians. Ann Intern Med 159: 471–483.	title	Not relevant
168	Quinnell TG & Smith LE (2004): Obstructive sleep apnoea in the elderly - Recognition and management considerations. Drugs & Aging 21: 307–322.	title	Not relevant
169	Rachmiel A, Aizenbud D & Peled M (2003): [Application of Ilizarov method in maxillofacial treatment]. Harefuah 142: 359–363, 397.	title	Not relevant
170	Rajasekaran S (2012): Kyphotic deformity in spinal tuberculosis and its management. International Orthopaedics 36: 359–365.	title	Not relevant
171	Remmelink HJ & Hoeke A (2010): [Dutch national guidelines for diagnosis and treatment of obstructive sleep apnea syndrome in adults]. Ned Tijdschr Tandheelkd 117: 227–231.	title	Not relevant
172	Ronchi P, Cinquini V, Ambrosoli A & Caprioglio A (2013): Maxillomandibular advancement in obstructive sleep apnea syndrome patients: a restrospective study on the sagittal cephalometric variables. Journal of oral & maxillofacial research 4: e5–e5.	title	Not relevant
173	Rose KJ, Burns J, Wheeler DM & North KN (2010): Interventions for increasing ankle range of motion in patients with neuromuscular disease. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
174	Rowbotham MC (2005): Is fibromyalgia a neuropathic pain syndrome? J Rheumatol Suppl 75: 38–40.	title	Not relevant
175	Sala H, Nigro C, Rabec C, Guardia AS & Smurra M (2001): [Argentine consensus on sleep-related respiratory disorders]. Medicina (B Aires) 61: 351–363.	title	Not relevant
176	Saletu B, Anderer P & Saletu-Zyhlarz GM (2013): Recent advances in sleep research. Psychiatr Danub 25: 426–434.	title	Not relevant
177	Schnabel A, Reichl SU, Meyer-Frießem C, Zahn PK & Pogatzki-Zahn E (2015): Tramadol for postoperative pain treatment in children. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
178	Schwab RJ & Goldberg AN (1998): Upper airway assessment - Radiographic and other imaging techniques. Otolaryngologic Clinics of North America 31: 931–+.	title	Not relevant
179	Schwab RJ (2001): Imaging for the snoring and sleep apnea patient. Dent Clin North Am 45: 759–796.	title	Not relevant
180	Schwengel DA, Sterni LM, Tunkel DE & Heitmiller ES (2009): Perioperative Management of Children with Obstructive Sleep Apnea. Anesthesia and Analgesia 109: 60–75.	title	Not relevant
181	Sesenna E, Magri AS, Magnani C, Brevi BC & Anghinoni ML (2012): Mandibular distraction in neonates: indications, technique, results. Ital J Pediatr 38: 7.	title	Not relevant
182	Sharma S, Essick G, Schwartz D & Aronsky AJ (2013): Sleep medicine care under one roof: a proposed model for integrating dentistry and medicine. J Clin Sleep Med 9: 827–833.	title	Not relevant
183	Sharples L, Glover M, Clutterbuck-James A, *et al.*. (2014): Clinical effectiveness and cost-effectiveness results from the randomised controlled Trial of Oral Mandibular Advancement Devices for Obstructive sleep apnoea-hypopnoea (TOMADO) and long-term economic analysis of oral devices and continuous positive airway pressure. Health Technol Assess 18: 1–296.	title	Not relevant
184	Sharples LD, Quinnell TG. Response to comments on "Meta-analysis of randomised controlled trials of oral mandibular advancement devices and continuous positive airway pressure for obstructive sleep apnoea-hypopnoea". Sleep Medicine Reviews. 2016;27:41-2.	title	Not relevant
185	Sheng X & Ren S (2016): Surgical techniques for osteoporotic vertebral collapse with delayed neurological deficits: A systematic review. Int J Surg 33: 42–48.	title	Not relevant
186	Shiomi T (2000): [Telemedicine and lifestyle modifications in obstructive sleep apnea patients]. Nihon rinsho Japanese journal of clinical medicine 58: 1689–92.	title	Not relevant
187	Shirley ED & Ain MC (2009): Achondroplasia: Manifestations and Treatment. Journal of the American Academy of Orthopaedic Surgeons 17: 231–241.	title	Not relevant
188	Shneerson J & Wright JJ (2001): Lifestyle modification for obstructive sleep apnoea. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
189	Smith I, Lasserson T & Wright J (2002): Drug treatments for obstructive sleep apnoea. The Cochrane database of systematic reviews CD003002-CD003002.	title	Not relevant
190	Smith I, Lasserson TJ & Wright J (2006): Drug therapy for obstructive sleep apnoea in adults. Cochrane Database of Systematic Reviews CD003002.	title	Not relevant
191	Sommer I, Lavigne G & Ettlin DA (2015): Review of self-reported instruments that measure sleep dysfunction in patients suffering from temporomandibular disorders and/or orofacial pain. Sleep Medicine 16: 27–38.	title	Not relevant
192	Stellzig-Eisenhauer A & Meyer-Marcotty P (2010): [Interaction between otorhinolaryngology and orthodontics: correlation between the nasopharyngeal airway and the craniofacial complex]. Laryngo- rhino- otologie 89 Suppl 1: S72-8.	title	Not relevant
193	Stuck BA, Dreher A, Heiser C, *et al.*. (2015): Diagnosis and treatment of snoring in adults-S2k Guideline of the German Society of Otorhinolaryngology, Head and Neck Surgery. Sleep Breath 19: 135–148.	title	Not relevant
194	Susarla SM, Thomas RJ, Abramson ZR & Kaban LB (2010): Biomechanics of the upper airway: Changing	title	Not relevant

	concepts in the pathogenesis of obstructive sleep apnea. International Journal of Oral and Maxillofacial Surgery 39: 1149–1159.		
195	Sutherland K, Lee RWW & Cistulli PA (2012): Obesity and craniofacial structure as risk factors for obstructive sleep apnoea: Impact of ethnicity. Respirology 17: 213–222.	title	Not relevant
196	Szpalski M & Gunzburg R (2002): What are the advances for surgical therapy of inflammatory diseases of the spine? Best Practice & Research in Clinical Rheumatology 16: 141–154.	title	Not relevant
197	Tate J & Tasota FJ (2002): More than a snore: recognizing the danger of sleep apnea. Nursing 32: 46–9.	title	Not relevant
198	Thiruvenkatachari B, Harrison JE, Worthington HV & O'Brien KD (2013): Orthodontic treatment for prominent upper front teeth (Class II malocclusion) in children. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
199	Tomatsu S, Sawamoto K, Almeciga-Diaz CJ, *et al.*. (2015): Impact of enzyme replacement therapy and hematopoietic stem cell transplantation in patients with Morquio A syndrome. Drug Design Development and Therapy 9: 1937–1953.	title	Not relevant
200	Toscano N, Sabol J, Holtzclaw D & Scott T (2011): Implant Repositioning by Segmental Osteotomy: A Case Series and Review. International Journal of Periodontics & Restorative Dentistry 31: E102–E108.	title	Not relevant
201	Tran DT, Newton EK, Mount VA, Lee JS, Wells GA & Perry JJ (2015): Rocuronium versus succinylcholine for rapid sequence induction intubation. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
202	Troester MM & Pelayo R (2015): Pediatric Sleep Pharmacology: A Primer. Seminars in Pediatric Neurology 22: 135–147.	title	Not relevant
203	Tulloch JF & McFarlane JM (1978): Neonatal respiratory distress. A simple cradle for micrognathia and glossoptosis. J Laryngol Otol 92: 403–410.	title	Not relevant
204	Tuncer T, Çay HF, Kaçar C, Altan L, Atik OS, Aydin AT, *et al.*. Evidence-based recommendations for the management of knee osteoarthritis: A consensus report of the Turkish league against rheumatism. Turkish Journal of Rheumatology. 2012;27(1):1-17.	title	Not relevant
205	Vairaktaris E, Semergidis T, Christopoulou P, Papadogeorgakis N & Martis C (1994): Lingual Thyroid - a New Surgical Approach - a Case-Report. Journal of Cranio-Maxillofacial Surgery 22: 307–310.	title	Not relevant
206	van Zuuren EJ, Fedorowicz Z, Carter B, van der Linden MM & Charland L (2015): Interventions for rosacea. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
207	Vanderveken OM, Boudewyns A, Ni Q, Kashyap B, Verbraecken J, De Backer W & Van de Heyning P (2011): Cardiovascular Implications in the Treatment of Obstructive Sleep Apnea. Journal of Cardiovascular Translational Research 4: 53–60.	title	Not relevant
208	Verlinden CRA, van de Vijfeijken SECM, Tuinzing DB, Becking AG & Swennen GRJ (2015): Complications of mandibular distraction osteogenesis for acquired deformities: a systematic review of the literature. Int J Oral Maxillofac Surg 44: 956–964.	title	Not relevant
209	Vicini C, Montevecchi F, Pang K, Bahgat A, Dallan I, Frassineti S, *et al.*. Combined transoral robotic tongue base surgery and palate surgery in obstructive sleep apnea-hypopnea syndrome: Expansion sphincter pharyngoplasty versus uvulopalatopharyngoplasty. Head and Neck. 2014;36(1):77-83.	title	Not relevant
210	Virk JS & Kotecha B (2016): Otorhinolaryngological aspects of sleep-related breathing disorders. Journal of Thoracic Disease 8: 213–223.	title	Not relevant
211	Wajon A, Vinycomb T, Carr E, Edmunds I & Ada L (2015): Surgery for thumb (trapeziometacarpal joint) osteoarthritis. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
212	Walker DA (2002): Management of severe mandibular retrognathia in the adult patient using distraction osteogenesis. Journal of Oral and Maxillofacial Surgery 60: 1341–1346.	title	Not relevant
213	Warren D & Drake A (1993): Cleft Nose - Form and Function. Clinics in Plastic Surgery 20: 769–779.	title	Not relevant
214	Watkinson S, Harrison JE, Furness S & Worthington HV (2013): Orthodontic treatment for prominent lower front teeth (Class III malocclusion) in children. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
215	Williams AC de C, Eccleston C & Morley S (2012): Psychological therapies for the management of chronic pain (excluding headache) in adults. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	title	Not relevant
216	Zhong L-P, Zheng J-W, Zhang W-L, Zhang S-Y, Zhu H-G, Ye W-M, Wang Y-A & Zhang Z-Y (2008): Multicentric Gorham's disease in the oral and maxillofacial region: report of a case and review of the literature. J Oral Maxillofac Surg 66: 1073–1076.	title	Not relevant
217	Willmott NS, Bryan R a. E & Duggal MS (2008): Molar-incisor-hypomineralisation: a literature review. Eur Arch Paediatr Dent 9: 172–179.	title	Not relevant
218	Abad VC & Guilleminault C (2009): Treatment options for obstructive sleep apnea. Current Treatment Options in Neurology 11: 358–367.	abstract	Not system. review
219	Agostino P, Ugolini A, Signori A, Silvestrini-Biavati A, Harrison JE & Riley P (2014): Orthodontic treatment for posterior crossbites. Cochrane Database of Systematic Reviews CD000979.	abstract	Not relevant
220	Ahrens A, McGrath C & Haegg U (2010): Subjective efficacy of oral appliance design features in the management of obstructive sleep apnea: A systematic review. American Journal of Orthodontics and Dentofacial Orthopedics 138: 559–576.	abstract	Not relevant
221	Al Qahtani ND (2016): Impact of different orthodontic treatment modalities on Airway. Pakistan Journal of Medical Sciences 32: 249–252.	abstract	Not system. review
222	Almeida FR & Lowe AA (2009): Principles of oral appliance therapy for the management of snoring and sleep disordered breathing. Oral Maxillofac Surg Clin North Am 21: 413–420.	abstract	Not relevant
223	Al-Moraissi EA, Al-Magaleh SM, Iskandar RA & Al-Hendi EA (2015): Impact on the pharyngeal airway space of different orthognathic procedures for the prognathic mandible. Int J Oral Maxillofac Surg 44: 1110–1118.	abstract	Not relevant
224	Alsufyani NA, Al-Saleh MAQ & Major PW (2013): CBCT assessment of upper airway changes and treatment outcomes of obstructive sleep apnoea: a systematic review. Sleep and Breathing 17: 911–923.	abstract	Not relevant
225	Amoric M (2013): Efficacy and compliance in treatment of sleep apnea with Herbst mandibular advancement splints (OHA version). Int Orthod 11: 193–209.	abstract	Not system. review
226	Ash MM & Ramfjord SP (1998): Reflections on the Michigan splint and other intraocclusal devices. J Mich Dent	abstract	Not relevant

	Assoc 80: 32–35, 41–46.		
227	Aurora RN, Zak RS, Karippot A, Lamm CI, Morgenthaler TI, Auerbach SH, *et al.*. Practice parameters for the respiratory indications for polysomnography in children. Sleep. 2011;34(3):379-88.	abstract	Not relevant
228	Ayas NT & Epstein LJ (1998): Oral appliances in the treatment of obstructive sleep apnea and snoring. Curr Opin Pulm Med 4: 355–360.	abstract	Not system. review
229	Azagra-Calero E, Espinar-Escalona E, Barrera-Mora J-M, Llamas-Carreras J-M & Solano-Reina E (2012): Obstructive Sleep Apnea Syndrome (OSAS). Review of the literature. Medicina Oral Patologia Oral Y Cirugia Bucal 17: E925–E929.	abstract	Not system. review
230	Aziz T, Ansari K, Lagravere MO, Major MP & Flores-Mir C (2015): Effect of non-surgical maxillary expansion on the nasal septum deviation: a systematic review. Progress in orthodontics 16: 15–15.	abstract	Not relevant
231	Bailey DR (2005): Dental therapy for obstructive sleep apnea. Seminars in Respiratory and Critical Care Medicine 26: 89–95.	abstract	Not system. review
232	Balk EM, Chung M, Chan JA, Moorthy D, Patel K, Concannon TW, Ratichek SJ & Chang LKW (2012): Future Research Needs for Treatment of Obstructive Sleep Apnea: Identification of Future Research Needs From Comparative Effectiveness Review No. 32. AHRQ Future Research Needs Papers. Rockville (MD): Agency for Healthcare Research and Quality (US).	abstract	Not relevant
233	Baratieri C, Alves Jr M, De Souza MMG, De Souza Araújo MT, Maia LC. Does rapid maxillary expansion have long-term effects on airway dimensions and breathing? American Journal of Orthodontics and Dentofacial Orthopedics. 2011;140(2):146-56.	abstract	Not relevant
234	Barewal RM & Hagen CC (2014): Management of snoring and obstructive sleep apnea with mandibular repositioning appliances: a prosthodontic approach. Dent Clin North Am 58: 159–180.	abstract	Not system. review
235	Barrera JE, Powell NB & Riley RW (2007): Facial skeletal surgery in the management of adult obstructive sleep apnea syndrome. Clinics in Plastic Surgery 34: 565–+.	abstract	Not system. review
236	Battagel JM, Johal A, L'Estrange PR, Croft CB & Kotecha B (1999): Changes in airway and hyoid position in response to mandibular protrusion in subjects with obstructive sleep apnoea (OSA). European Journal of Orthodontics 21: 363–376.	abstract	Primary study
237	Bennett LS, Davies RJO & Stradling JR (1998): Oral appliances for the management of snoring and obstructive sleep apnoea. Thorax 53: S58–S64.	abstract	Primary study
238	Bettega G, Breton P, Goudot P, *et al.*. (2015): [Mandibular advancement device for obstructive sleep apnea treatment in adults. July 2014]. Rev Stomatol Chir Maxillofac Chir Orale 116: 28–57.	abstract	Not system. review
239	Bettega G, Pepin JL, Orliaguet O, Levy P & Raphael B (2002): [Surgery and obstructive sleep apnea syndrome: indications and precautions]. Revue de stomatologie et de chirurgie maxillo-faciale 103: 181–7.	abstract	Not system. review
240	Bilston LE & Gandevia SC (2014): Biomechanical properties of the human upper airway and their effect on its behavior during breathing and in obstructive sleep apnea. Journal of Applied Physiology 116: 314–324.	abstract	Not relevant
241	Bloch KE (2006): Alternatives to CPAP in the treatment of the obstructive sleep apnoea syndrome. Swiss Medical Weekly 136: 261–267.	abstract	Not system. review
242	Blumen M, Crampette L, Fischler M, *et al.*. (2010): [Surgical treatment of obstructive sleep apnea syndrome]. Rev Mal Respir 27 Suppl 3: S157-165.	abstract	Practice guideline
243	Bouchard C, Troulis MJ & Kaban LB (2009): Management of Obstructive Sleep Apnea: Role of Distraction Osteogenesis. Oral and Maxillofacial Surgery Clinics of North America 21: 459–+.	abstract	Not system. review
244	Boyd SB (2009): Management of Obstructive Sleep Apnea by Maxillomandibular Advancement. Oral and Maxillofacial Surgery Clinics of North America 21: 447–+.	abstract	Practice guideline
245	Bratton DJ, Kohler M. Comments on "Meta-analysis of randomised controlled trials of oral mandibular advancement devices and continuous positive airway pressure for obstructive sleep apnoea-hypopnoea" by Sharples *et al.*. Sleep Medicine Reviews. 2016;27:39-40.	abstract	Comments
246	Brown MS, Okada H, Valiathan M, Lakin GE. 45 Years of simultaneous le Fort III and le Fort i osteotomies: A systematic literature review. Cleft Palate-Craniofacial Journal. 2015;52(4):471-9.	abstract	Not relevant
247	Buck LM, Dalci O, Darendeliler MA & Papadopoulou AK (2016): Effect of Surgically Assisted Rapid Maxillary Expansion on Upper Airway Volume: A Systematic Review. J Oral Maxillofac Surg 74: 1025–1043.	abstract	Not relevant
248	Bury SB, Singh A. The role of nasal treatments in snoring and obstructive sleep apnoea. Current Opinion in Otolaryngology and Head and Neck Surgery. 2015;23(1):39-46.	abstract	Not system. review
249	Camacho M, Certal V & Capasso R (2013): Comprehensive review of surgeries for obstructive sleep apnea syndrome. Brazilian Journal of Otorhinolaryngology 79: 780–788.	abstract	Not system. review
250	Campos-Juanatey F, Fernandez-Barriales M, Gonzalez M & Portillo-Martin JA (2016): Effects of obstructive sleep apnea and its treatment over the erectile function: a systematic review. Asian J Androl.	abstract	Not relevant
251	Cartwright R (2001): What's new in oral appliances for snoring and sleep apnea: an update. Sleep Medicine Reviews 5: 25–32.	abstract	Not system. review
252	Carvalho B, Hsia J & Capasso R (2012): Surgical Therapy of Obstructive Sleep Apnea: A Review. Neurotherapeutics 9: 710–716.	abstract	Not system. review
253	Chan ASL & Cistulli PA (2009): Oral appliance treatment of obstructive sleep apnea: an update. Curr Opin Pulm Med 15: 591–596.	abstract	Not system. review
254	Chan ASL, Lee RWW & Cistulli PA (2008): Non-positive airway pressure modalities: mandibular advancement devices/positional therapy. Proc Am Thorac Soc 5: 179–184.	abstract	Not system. review
255	Chen H & Lowe AA (2013): Updates in oral appliance therapy for snoring and obstructive sleep apnea. Sleep and Breathing 17: 473–486.	abstract	Not system. review
256	Chhajed PN, Chhajed TP, Tamm M & Strobel W (2004): Obstructive sleep apnea: therapies other than CPAP. J Assoc Physicians India 52: 143–151.	abstract	Not system. review
257	Chwiesko-Minarowska S, Minarowski L, Kuryliszyn-Moskal A, Chwiesko J & Chyczewska E (2013): Rehabilitation of patients with obstructive sleep apnea syndrome. International Journal of Rehabilitation Research 36: 291–297.	abstract	Not relevant
258	Cistulli PA & Grunstein RR (2005): Medical devices for the diagnosis and treatment of obstructive sleep apnea.	abstract	Not system. review

	Expert Rev Med Devices 2: 749–763.		
259	Cistulli PA (1996): Craniofacial abnormalities in obstructive sleep apnoea: implications for treatment. Respirology (Carlton, Vic) 1: 167–74.	abstract	Not relevant
260	Cistulli PA, Gotsopoulos H, Marklund M & Lowe AA (2004): Treatment of snoring and obstructive sleep apnea with mandibular repositioning appliances. Sleep Med Rev 8: 443–457.	abstract	Not system. review
261	Clark GT & Nakano M (1989): Dental appliances for the treatment of obstructive sleep apnea. J Am Dent Assoc 118: 611–615, 617–619.	abstract	Not system. review
262	Cohen RB (1995): Obstructive sleep apnea: a mandibular positioning device for treatment and diagnosis of an obstruction site. Compendium of continuing education in dentistry (Jamesburg, NJ : 1995) 16: 622–629.	abstract	Primary study
263	Cohen-Levy J, Garcia R, Pételle B & Fleury B (2009): Treatment of the obstructive sleep apnea syndrome in adults by mandibular advancement device: the state of the art. Int Orthod 7: 287–304.	abstract	Not system. review
264	Conley RS (2011): Evidence for dental and dental specialty treatment of obstructive sleep apnoea. Part 1: the adult OSA patient and Part 2: the paediatric and adolescent patient. J Oral Rehabil 38: 136–156.	abstract	Not system. review
265	Conley RS (2015): Management of sleep apnea: a critical look at intra-oral appliances. Orthod Craniofac Res 18 Suppl 1: 83–90.	abstract	Not system. review
266	Costello BJ & Posnick JC (2003): The role of maxillofacial osteotomies in the treatment of obstructive sleep apnea. Current opinion in otolaryngology & head and neck surgery 11: 267–74.	abstract	Not system. review
267	Crampette L, Carlander B, Mondain M, Billiard M, Guerrier B & Dejean Y (1992): Surgical Alternatives to Uvulopalatopharyngoplasty in Sleep-Apnea Syndrome. Sleep 15: S63–S68.	abstract	Not system. review
268	Crockett DJ & Goudy SL (2014): Update on surgery for velopharyngeal dysfunction. Curr Opin Otolaryngol Head Neck Surg 22: 267–275.	abstract	Not relevant
269	Cuccia AM & Caradonna C (2007): Mandibular advancement devices: indications and predictors of treatment outcome. A review. Minerva Stomatol 56: 427–443.	abstract	Not system. review
270	Daftary AS & Kotagal S (2010): Treatment of Childhood Obstructive Sleep Apnea. Current Treatment Options in Neurology 12: 369–378.	abstract	Not relevant
271	De Almeida FR. Complexity and efficacy of mandibular advancement splints: Understanding their mode of action. Journal of Clinical Sleep Medicine. 2011;7(5):447-8.	abstract	Not system. review
272	De Corso E, Bastanza G, Della Marca G, *et al.*. (2015): Drug-induced sleep endoscopy as a selection tool for mandibular advancement therapy by oral device in patients with mild to moderate obstructive sleep apnoea. Acta Otorhinolaryngol Ital 35: 426–432.	abstract	Primary study
273	De Coster T (2006): [Orthopedic expansion of the maxilla]. L' Orthodontie francaise 77: 253–64.	abstract	Not relevant
274	de Gijt JP, Vervoorn K, Wolvius EB, Van der Wal KGH & Koudstaal MJ (2012): Mandibular midline distraction: A systematic review. Journal of Cranio-Maxillofacial Surgery 40: 248–260.	abstract	Not relevant
275	Dehlink E & Tan H-L (2016): Update on paediatric obstructive sleep apnoea. Journal of Thoracic Disease 8: 224–235.	abstract	Not relevant
276	Dieltjens M, Vanderveken OM, Heyning PHV de & Braem MJ (2012): Current opinions and clinical practice in the titration of oral appliances in the treatment of sleep-disordered breathing. Sleep Med Rev 16: 177–185.	abstract	Not system. review
277	Donovan TE, Marzola R, Becker W, Cagna DR, Eichmiller F, McKee JR, Metz JE & Albouy J-P (2015): Annual review of selected scientific literature: Report of the Committee on Scientific Investigation of the American Academy of Restorative Dentistry. Journal of Prosthetic Dentistry 114: 756–809.	abstract	Not system. review
278	dos Santos Canellas JV, Mendes Barros HL, D'Albuquerque Medeiros PJ & Ritto FG (2016): Sleep-disordered breathing following mandibular setback: a systematic review of the literature. Sleep and Breathing 20: 387–394.	abstract	Not relevant
279	Dreher A, de la Chaux R, Behr J, Eisensehr I, Grevers G & Kastenbauer E (2001): [Obstructive sleep apnea syndrome. Which therapy for which patients]. MMW Fortschritte der Medizin 143: 25–9.	abstract	Not system. review
280	Eckhart JE (1998): Comparisons of oral devices for snoring. J Calif Dent Assoc 26: 611–623.	abstract	Not relevant
281	Eichenberger M & Baumgartner S (2014): The impact of rapid palatal expansion on children's general health: a literature review. Eur J Paediatr Dent 15: 67–71.	abstract	Not system. review
282	Ephros HD, Madani M & Yalamanchili SC (2010): Surgical treatment of snoring & obstructive sleep apnoea. Indian J Med Res 131: 267–276.	abstract	Not system. review
283	Ferguson K (2001): Oral appliance therapy for obstructive sleep apnea: finally evidence you can sink your teeth into. Am J Respir Crit Care Med 163: 1294–1295.	abstract	Not system. review
284	Fernández-Ferrer L, Montiel-Company JM, Pinho T, Almerich-Silla JM & Bellot-Arcís C (2015): Effects of mandibular setback surgery on upper airway dimensions and their influence on obstructive sleep apnoea - a systematic review. J Craniomaxillofac Surg 43: 248–253.	abstract	Not relevant
285	Fields BG, Rosen IM. Treatment of sleep-related breathing disorders. Annals of the American Thoracic Society. 2014;11(9):1485-6.	abstract	Not relevant
286	Fleisher KE & Krieger AC (2007): Current trends in the treatment of obstructive sleep apnea. Journal of Oral and Maxillofacial Surgery 65: 2056–2068.	abstract	Not relevant
287	Fleissig Y, Laviv A, Peacock ZS & Casap N (2015): [Obstructive Sleep Apnea: review and a case presentation]. Refu'at ha-peh veha-shinayim (1993) 32: 6–66.	abstract	Not relevant
288	Fleury B, Cohen-Levy J, Lacassagne L, Buchet I, Geraads A, Pegliasco H & Gagnadoux F (2010): [Treatment of obstructive sleep apnea syndrome using a mandibular advancement device]. Rev Mal Respir 27 Suppl 3: S146-156.	abstract	Not system. review
289	Fleury B, Petelle B, Rakotonanahary D, N'Gyuen-Plantin X-L & Vincent G (2004): [Treatment of obstructive sleep apnea syndrome with mandibular advancement orthesis]. Rev Mal Respir 21: S81-85.	abstract	Not system. review
290	Fransson A (2003): A mandibular protruding device in obstructive sleep apnea and snoring. Swed Dent J Suppl 1–49.	abstract	Primary study
291	Friedlander AH, Friedlander IK & Pogrel MA (2000): Dentistry's role in the diagnosis and co-management of patients with sleep apnoea/hypopnoea syndrome. Br Dent J 189: 76–80.	abstract	Not relevant
292	Fritsch K & Bloch KE (2000): [Noninvasive alternatives to CPAP in therapy of obstructive sleep apnea	abstract	Not system. review

	syndrome]. Ther Umsch 57: 449–453.		
293	Fujisawa M (2010): Research projects on jaw function and occlusion published in 2008 by members of the Japan Prosthodontic Society: a review. J Prosthodont Res 54: 55–58.	abstract	Not system. review
294	Gagnadoux F (2006): [The mandibular advancement splint: a true therapeutic alternative]. Rev Mal Respir 23 Spec No 2: 7S51-57S54.	abstract	Not relevant
295	George PT (2001): Selecting sleep-disordered-breathing appliances - Biomechanical considerations. Journal of the American Dental Association 132: 339–347.	abstract	Not system. review
296	Gilon Y, Raskin S, Heymans O & Poirrier R (2002): [The role of maxillofacial surgery in obstructive sleep hypopnea and apnea syndrome]. Revue belge de medecine dentaire 57: 93–110.	abstract	Not relevant
297	Goldberg R (2000): Treatment of obstructive sleep apnea, other than with continuous positive airway pressure. Current opinion in pulmonary medicine 6: 496–500.	abstract	Not system. review
298	Goodday R (2009): Diagnosis, Treatment Planning, and Surgical Correction of Obstructive Sleep Apnea. Journal of Oral and Maxillofacial Surgery 67: 2183–2196.	abstract	Not relevant
299	Gregg JM, Zedalis D, Howard CW, Boyle RP & Prussin AJ (2000): Surgical alternatives for treatment of obstructive sleep apnoea: review and case series. Annals of the Royal Australasian College of Dental Surgeons 15: 181–4.	abstract	Not relevant
300	Grime C & Tan H (2015): Sleep Disordered Breathing in Children. Indian Journal of Pediatrics 82: 945–955.	abstract	Not relevant
301	Guilleminault C & Quo SD (2001): Sleep-disordered breathing. A view at the beginning of the new Millennium. Dent Clin North Am 45: 643–656.	abstract	Not relevant
302	Guilleminault C (1987): Obstructive sleep apnea syndrome. A review. The Psychiatric clinics of North America 10: 607–21.	abstract	Not relevant
303	Gupta NK, Dwivedi R, Tandan A, Singh NS. An innovative design for mandibular repositioning appliance in treating obstructive sleep apnea and snoring. Indian Journal of Public Health Research and Development. 2012;3(1):19-23.	abstract	Primary study
304	Gwanmesia I, Jeelani O, Hayward R & Dunaway D (2015): Frontofacial Advancement by Distraction Osteogenesis: A Long-Term Review. Plastic and Reconstructive Surgery 135: 553–560.	abstract	Not relevant
305	Halbower AC, Ishman SL & McGinley BM (2007): Childhood obstructive sleep-disordered breathing - A clinical update and discussion of technological innovations and challenges. Chest 132: 2030–2041.	abstract	Not relevant
306	Han D & Zhang L (2011): Nasal cavity ventilation expansion techniques. Acta Otolaryngol 131: 1244–1248.	abstract	Not relevant
307	Harrison JE & Ashby D (2000): Orthodontic treatment for posterior crossbites. Cochrane Database Syst Rev CD000979.	abstract	Not relevant
308	Heidsieck DSP, de Ruiter MHT & de Lange J (2016): Management of obstructive sleep apnea in edentulous patients: an overview of the literature. Sleep and Breathing 20: 395–404.	abstract	Not relevant
309	Heitman SJ & Flemons WW (2001): Evidence-based medicine and sleep apnea. Respir Care 46: 1418-1432-1434.	abstract	Not relevant
310	Hochban W & Hoch B (1998): [Obstructive sleep apnea in the child: an interdisciplinary treatment concept with special reference to craniofacial changes]. Pneumologie (Stuttgart, Germany) 52: 147–53.	abstract	Not relevant
311	Hoffstein V (2007): Review of oral appliances for treatment of sleep-disordered breathing. Sleep and Breathing 11: 1–22.	abstract	Not system. review
312	Holty J-EC & Guilleminault C (2010): Surgical Options for the Treatment of Obstructive Sleep Apnea. Medical Clinics of North America 94: 479-515.	abstract	Not relevant
313	Horchover RL (2007): Oral appliances for the treatment of obstructive sleep apnea. Asian Biomedicine 1: 49–52.	abstract	Not system. review
314	Ige Afuso M & Chumacero Ortiz J (2010): Manteniendo la permeabilidad de la vía aérea. Acta Médica Peruana 27: 270–280.	abstract	Not relevant
315	Ivanhoe JR & Attanasio R (2001): Sleep disorders and oral devices. Dent Clin North Am 45: 733–758.	abstract	Not relevant
316	Ivanhoe JR, Cibirka RM, Lefebvre CA & Parr GR (1999): Dental considerations in upper airway sleep disorders: A review of the literature. J Prosthet Dent 82: 685–698.	abstract	Not system. review
317	Jayesh system. review & Bhat WM (2015): Mandibular advancement device for obstructive sleep apnea: An overview. J Pharm Bioallied Sci 7: S223-225.	abstract	Not relevant
318	Johal A & Battagel JM (2001): Current principles in the management of obstructive sleep apnoea with mandibular advancement appliances. Br Dent J 190: 532–536.	abstract	Not relevant
319	Johal A (2008): A review of the use of mandibular advancement appliances in sleep-disordered breathing. Dental update 35: 230–2, 234–5.	abstract	Not relevant
320	Johnson MD (2015): Office management of obstructive sleep apnoea: appliances. Curr Opin Otolaryngol Head Neck Surg 23: 323–328.	abstract	Not relevant
321	Kaditis AG, Alvarez MLA, Boudewyns A, Alexopoulos EI, Ersu R, Joosten K, *et al.*. Obstructive sleep disordered breathing in 2- to 18-year-old children: Diagnosis and management. European Respiratory Journal. 2016;47(1):69-94.	abstract	Not relevant
322	Kapila SD & Nervina JM (2015): CBCT in orthodontics: assessment of treatment outcomes and indications for its use. Dentomaxillofac Radiol 44: 20140282.	abstract	Not relevant
323	Keymel S, Kelm M & Randerath WJ (2013): [Non-CPAP therapies in obstructive sleep apnoea: an overview]. Pneumologie (Stuttgart, Germany) 67: 50–7.	abstract	Not relevant
324	Kiliç N & Oktay H (2008): Effects of rapid maxillary expansion on nasal breathing and some naso-respiratory and breathing problems in growing children: a literature review. Int J Pediatr Otorhinolaryngol 72: 1595–1601.	abstract	Not relevant
325	Koudstaal MJ, Poort LJ, van der Wal KGH, Wolvius EB, Prahl-Andersen B & Schulten AJM (2005): Surgically assisted rapid maxillary expansion (SARME): a review of the literature. Int J Oral Maxillofac Surg 34: 709–714.	abstract	Not system. review
326	Kuzniar TJ, Kovacevic-Ristanovic R & Freedom T (2011): Complex sleep apnea unmasked by the use of a mandibular advancement device. Sleep and Breathing 15: 249–252.	abstract	Primary study
327	Laaban JP (2002): [Sleep apnea syndrome and obesity]. Revue de pneumologie clinique 58: 91–8.	abstract	Not relevant
328	Lesclous P, Dersot JM & Valentin C (2004): Mandibular advancement devices for obstructive sleep apneas:	abstract	Not relevant

	specialists cooperation is needed. Revue Des Maladies Respiratoires 21: 689–692.		
329	Levrini L, Lorusso P, Caprioglio A, Magnani A, Diaféria G, Bittencourt L & Bommarito S (2014): Model of oronasal rehabilitation in children with obstructive sleep apnea syndrome undergoing rapid maxillary expansion: Research review. Sleep Sci 7: 225–233.	abstract	Not relevant
330	Li D, Yang X & Guo T (2010): [Research progress on the treatment of obstructive sleep apnea and hypopnea syndrome with mandibular advancement device]. Shanghai kou qiang yi xue = Shanghai journal of stomatology 19: 216–9.	abstract	Not relevant
331	Li H-Y & Lee L-A (2009): Sleep-disordered breathing in children. Chang Gung Med J 32: 247–257.	abstract	Not system. review
332	Li KK (2005): Surgical therapy for adult obstructive sleep apnea. Sleep Medicine Reviews 9: 201–209.	abstract	Not system. review
333	Li KK (2005): Surgical therapy for obstructive sleep apnea syndrome. Seminars in Respiratory and Critical Care Medicine 26: 80–88.	abstract	Not system. review
334	Li KK (2007): Hypopharyngeal airway surgery. Otolaryngologic Clinics of North America 40: 845–+.	abstract	Not system. review
335	Li KK, Riley RW, Powell NB, Troell R & Guilleminault C (1999): Overview of phase II surgery for obstructive sleep apnea syndrome. Ear, nose, & throat journal 78: 854–7.	abstract	Not system. review
336	Li KK. - Maxillomandibular advancement for obstructive sleep apnea. - J Oral Maxillofac Surg;69(3): 687-94, 2011 Mar.	abstract	Not system. review
337	Lindman R & Bondemark L (2001): A review of oral devices in the treatment of habitual snoring and obstructive sleep apnoea. Swed Dent J 25: 39–51.	abstract	Not system. review
338	Lloberes P, Durán-Cantolla J, Martínez-García MÁ, *et al.*. (2011): Diagnosis and treatment of sleep apnea-hypopnea syndrome. Spanish Society of Pulmonology and Thoracic Surgery. Arch Bronconeumol 47: 143–156.	abstract	Not relevant
339	Lockhart R, Dichamp J & Bertrand JC (1996): [Treatment of obstructive sleep apnea syndrome using a mandibular advancement prosthesis: review of the literature]. Rev Stomatol Chir Maxillofac 97: 365–373.	abstract	Not system. review
340	Lye KW (2008): Effect of orthognathic surgery on the posterior airway space (PAS). Annals Academy of Medicine Singapore 37: 677–682.	abstract	Not system. review
341	Maciel Santos MES, Rocha NS, Laureano Filho JR, Ferraz EM & Campos JM (2009): Obstructive sleep apnea-hypopnea syndrome--the role of bariatric and maxillofacial surgeries. Obesity surgery 19: 796–801.	abstract	Not system. review
342	Madani M, Madani FM & Peysakhov D (2011): Reoperative treatment of obstructive sleep apnea. Oral Maxillofac Surg Clin North Am 23: 177–187, viii.	abstract	Not system. review
343	Magliocca KR & Helmam JI (2005): Obstructive sleep apnea - Diagnosis, medical management and dental implications. Journal of the American Dental Association 136: 1121–1129.	abstract	Not relevant
344	Marshall MW (1998): Surgical options for obstructive sleep apnea. Journal of the California Dental Association 26: 579–84, 589–90.	abstract	Not system. review
345	Maurer JT & Stuck BA (2008): Update on upper airway evaluation in obstructive sleep apnea. Hno 56: 1089–1097.	abstract	Not relevant
346	McDonald JP (2003): A review of surgical treatment for obstructive sleep apnoea/hypopnoea syndrome. The surgeon : journal of the Royal Colleges of Surgeons of Edinburgh and Ireland 1: 259–64.	abstract	Not system. review
347	McMains KC & Terris DJ (2003): Evidence-based medicine in sleep apnea surgery. Otolaryngologic Clinics of North America 36: 539–+.	abstract	Not relevant
348	Meslemani D & Jones LR (2011): Skeletal surgery in sleep apnea. Current Opinion in Otolaryngology & Head and Neck Surgery 19: 307–311.	abstract	Not system. review
349	Milano F, Mondini S, Billi MC, Gobbi R, Gracco A & Sorrenti G (2013): The impact of a multidisciplinary approach on response rate of mandibular advancing device therapy in patients with obstructive sleep apnoea syndrome. Acta Otorhinolaryngol Ital 33: 337–342.	abstract	Primary study
350	Miles PG, Nimkarn Y & De Leeuw BJ (1996): Dentistry's role in obstructive sleep apnoea. Review and case report. Aust Dent J 41: 248–251.	abstract	Not relevant
351	Millman RP & Rosenberg C (1995): A dental and medical approach to sleep apnea. Part I: An overview of sleep apnea. Rhode Island dental journal 28: 7–5, 7.	abstract	Not relevant
352	Moreau P & Bonnet S (1993): Surgical treatment of snoring and sleep apnea syndrome. Acta Oto-Rhino-Laryngologica Belgica 47: 291–299.	abstract	Not system. review
353	Muir JF & Portier F (2002): [Obstructive sleep apnea syndrome: medical treatment]. Rev Stomatol Chir Maxillofac 103: 164–169.	abstract	Not system. review
354	Ng A, Gotsopoulos H, Darendeliler AM & Cistulli PA (2005): Oral appliance therapy for obstructive sleep apnea. Treat Respir Med 4: 409–422.	abstract	Not relevant
355	Ngiam J & Cistulli PA (2015): Dental treatment for paediatric obstructive sleep apnea. Paediatr Respir Rev 16: 174–181.	abstract	Not relevant
356	Nogueira F, Nigro C, Cambursano H, Borsini E, Silio J & Avila J (2013): [Practical guidelines for the diagnosis and treatment of obstructive sleep apnea syndrome]. Medicina (B Aires) 73: 349–362.	abstract	Practice guideline
357	Nout E, Cesteleyn LLM, van der Wal KGH, van Adrichem LNA, Mathijssen IMJ & Wolvius EB (2008): Advancement of the midface, from conventional Le Fort III osteotomy to Le Fort III distraction: review of the literature. International Journal of Oral and Maxillofacial Surgery 37: 781–789.	abstract	Not relevant
358	Packham S & Ebden P (2000): Recent advances in the sleep apnoea/hypopnoea syndrome. Hospital Medicine 61: 108–111.	abstract	Not relevant
359	Padma A, Ramakrishnan N & Narayanan V (2007): Management of obstructive sleep apnea: A dental perspective. Indian J Dent Res 18: 201–209.	abstract	Not relevant
360	Padmanaban V, Kavitha PR & Hegde AM (2010): Sleep Disordered Breathing in Children - A Review and the Role of a Pediatric Dentist. Journal of Clinical Pediatric Dentistry 35: 15–21.	abstract	Not relevant
361	Pliska BT & Almeida F (2012): Effectiveness and outcome of oral appliance therapy. Dent Clin North Am 56: 433–444.	abstract	Not system. review
362	Powell NB (2009): Contemporary Surgery for Obstructive Sleep Apnea Syndrome. Clinical and Experimental Otorhinolaryngology 2: 107–114.	abstract	Not system. review

363	Prinsell JR (2002): Maxillomandibular advancement surgery for obstructive sleep apnea syndrome. J Am Dent Assoc 133: 1489-1497-1540.	abstract	Not system. review
364	Quinnell TG & Clutterbuck-James AL (2014): Alternatives to continuous positive airway pressure 2: mandibular advancement devices compared. Curr Opin Pulm Med 20: 595–600.	abstract	Not system. review
365	Ramires T, Maia RA & Barone JR (2008): Alterações da cavidade nasal e do padrão respiratório após expansão maxilar. Revista Brasileira de Otorrinolaringologia 74: 763–769.	abstract	Not relevant
366	Raphaelson MA, Alpher EJ, Bakker KW & Perlstrom JR (1998): Oral appliance therapy for obstructive sleep apnea syndrome: progressive mandibular advancement during polysomnography. Cranio 16: 44–50.	abstract	Primary study
367	Reinert S, Jung D & Machtens E (1996): [Principles of surgical treatment of obstructive sleep apnea by interventions on the facial bones]. Wiener medizinische Wochenschrift (1946) 146: 368–72.	abstract	Not relevant
368	Remmelink HJ (2003): [State-of-the-art in the treatment of snoring and sleep apnea]. Ned Tijdschr Tandheelkd 110: 38–45.	abstract	Not relevant
369	Rodríguez-Lozano FJ, Sáez-Yuguero M del R, Linares Tovar E & Bermejo Fenoll A (2008): Sleep apnea and mandibular advancement device. Revision of the literature. Med Oral Patol Oral Cir Bucal 13: E549-554.	abstract	Not relevant
370	Rogers RR (2012): Past, present, and future use of oral appliance therapies in sleep-related breathing disorders. J Calif Dent Assoc 40: 151–157.	abstract	Not relevant
371	Rose E (2006): [Use of oral appliances in therapy of sleep related breathing disorders]. Laryngo- rhino- otologie 85 Suppl 1: 26–9.	abstract	Not relevant
372	Ryan CF (2005): Sleep center dot 9: An approach to treatment of obstructive sleep apnoea/hypopnoea syndrome including upper airway surgery. Thorax 60: 595–604.	abstract	Not relevant
373	Saboisky JP, Chamberlin NL & Malhotra A (2009): Potential therapeutic targets in obstructive sleep apnoea. Expert Opinion on Therapeutic Targets 13: 795–809.	abstract	Not relevant
374	Schönhofer B, Wenzel M, Barchfeld T, Siemon K, Rager H & Köhler D (1997): [Value of various intra- and extraoral therapeutic procedures for treatment of obstructive sleep apnea and snoring]. Med Klin (Munich) 92: 167–174.	abstract	Primary study
375	Senders CW & Strong EB (2003): The surgical treatment of obstructive sleep apnea. Clinical Reviews in Allergy & Immunology 25: 213–220.	abstract	Not relevant
376	Series F (1996): Evaluation of treatment efficacy in sleep apnea hypopnea syndrome. Sleep 19: S71–S76.	abstract	Not relevant
377	Sher AE (1995): Update on upper airway surgery for obstructive sleep apnea. Current opinion in pulmonary medicine 1: 504–11.	abstract	Not relevant
378	Sher AE (1999): Surgical management of obstructive sleep apnea. Progress in Cardiovascular Diseases 41: 387–396.	abstract	Not relevant
379	Sher AE (2002): Upper airway surgery for obstructive sleep apnea. Sleep Medicine Reviews 6: 195–212.	abstract	Not relevant
380	Sherring D, Vowles N, Antic R, Krishnan S & Goss AN (2001): Obstructive sleep apnoea: a review of the orofacial implications. Aust Dent J 46: 154–165.	abstract	Not relevant
381	Shigemoto S, Shigeta Y, Nejima J, Ogawa T, Matsuka Y & Clark GT (2015): Diagnosis and treatment for obstructive sleep apnea: Fundamental and clinical knowledge in obstructive sleep apnea. J Prosthodont Res 59: 161–171.	abstract	Not relevant
382	Shochat T & Pillar G (2003): Sleep apnoea in the older adult - Pathophysiology, epidemiology, consequences and management. Drugs & Aging 20: 551–560.	abstract	Not relevant
383	Shott system. review (2011): Evaluation and management of pediatric obstructive sleep apnea beyond tonsillectomy and adenoidectomy. Curr Opin Otolaryngol Head Neck Surg 19: 449–454.	abstract	Not relevant
384	Shrivastava D (2014): Impact of sleep-disordered breathing treatment on upper airway anatomy and physiology. Sleep Med 15: 733–741.	abstract	Not relevant
385	Simonds AK (2000): New developments in the treatment of obstructive sleep apnoea. Thorax 55: S45–S50.	abstract	Primary study
386	Sinha D & Guilleminault C (2010): Sleep disordered breathing in children. Indian J Med Res 131: 311–320.	abstract	Not relevant
387	Sonego CL, Bobrowski ÂN, Chagas OL & Torriani MA (2014): Aesthetic and functional implications following rotation of the maxillomandibular complex in orthognathic surgery: a systematic review. Int J Oral Maxillofac Surg 43: 40–45.	abstract	Not relevant
388	Song SA, Wei JM, Buttram J, Tolisano AM, Chang ET, Yung-Chuan S, Certal V & Camacho M (2016): Hyoid Surgery Alone for Obstructive Sleep Apnea: A Systematic Review and Meta-analysis. Laryngoscope 126: 1702–1708.	abstract	Not relevant
389	Soose RJ (2016): Novel Surgical Approaches for the Treatment of Obstructive Sleep Apnea. Sleep Med Clin 11: 189–202.	abstract	Not relevant
390	Sorel O (2004): [Rapid palatal expansion for the treatment of maxillary constriction]. Rev Stomatol Chir Maxillofac 105: 26–36.	abstract	Not relevant
391	Sousa Maciel Santos ME, Rocha NS, Laureano Filho JR, Ferraz EM & Campos JM (2009): Obstructive Sleep Apnea-Hypopnea Syndrome-The Role of Bariatric and Maxillofacial Surgeries. Obesity Surgery 19: 796–801.	abstract	Not relevant
392	Spicuzza L, Caruso D & Di Maria G (2015): Obstructive sleep apnoea syndrome and its management. Ther Adv Chronic Dis 6: 273–285.	abstract	Not relevant
393	Stuck BA & Maurer JT (2008): Airway evaluation in obstructive sleep apnea. Sleep Medicine Reviews 12: 411–436.	abstract	Not relevant
394	Sulman CG (2014): Pediatric sleep surgery. Front Pediatr 2: 51.	abstract	Not relevant
395	Sunitha C & Kumar SA (2010): Obstructive sleep apnea and its management. Indian J Dent Res 21: 119–124.	abstract	Not relevant
396	Sutherland K & Cistulli P (2011): Mandibular advancement splints for the treatment of sleep apnea syndrome. Swiss Med Wkly 141: w13276.	abstract	Not relevant
397	Sutherland K, Vanderveken OM, Tsuda H, Marklund M, Gagnadoux F, Kushida CA & Cistulli PA (2014): Oral appliance treatment for obstructive sleep apnea: an update. J Clin Sleep Med 10: 215–227.	abstract	Not system. review
398	Tan H-L, Kheirandish-Gozal L & Gozal D (2016): Obstructive sleep apnea in children: update on the recognition, treatment and management of persistent disease. Expert Review of Respiratory Medicine 10: 431–439.	abstract	Not relevant

399	Tapia IE & Marcus CL (2013): Newer treatment modalities for pediatric obstructive sleep apnea. Paediatr Respir Rev 14: 199–203.	abstract	Not relevant
400	Tauman R & Gozal D (2011): Obstructive sleep apnea syndrome in children. Expert Review of Respiratory Medicine 5: 425–440.	abstract	Not relevant
401	Thawley S (1985): Surgical-Treatment of Obstructive Sleep-Apnea. Medical Clinics of North America 69: 1337–1358.	abstract	Not relevant
402	Trang H (2006): [Obstructive sleep apnea treatment in children]. Rev Mal Respir 23 Spec No 2: 7S128-127S130.	abstract	Not system. review
403	Triplett W, Lund B, Westbrook P & Olsen K (1989): Obstructive Sleep-Apnea Syndrome in Patients with Class-Ii Malocclusion. Mayo Clinic Proceedings 64: 644–652.	abstract	Not relevant
404	Troell RJ, Powell NB & Riley RW (1998): Hypopharyngeal airway surgery for obstructive sleep apnea syndrome. Seminars in Respiratory and Critical Care Medicine 19: 175–183.	abstract	Not system. review
405	Troell RJ, Riley RW, Powell NB & Li K (1998): Surgical management of the hypopharyngeal airway in sleep disordered breathing. Otolaryngologic Clinics of North America 31: 979–+.	abstract	Not system. review
406	Tucker Woodson B (2008): Structural effectiveness of pharyngeal sleep apnea surgery. Sleep medicine reviews 12: 463–79.	abstract	Not relevant
407	Urquhart DS (2013): Investigation and management of childhood sleep apnoea. Hippokratia 17: 196–202.	abstract	Not relevant
408	Veasey SC (2003): Molecular and physiologic basis of obstructive sleep apnea. Clinics in Chest Medicine 24: 179–+.	abstract	Not relevant
409	Verse T & Hoermann K (2011): The Surgical Treatment of Sleep-Related Upper Airway Obstruction. Deutsches Arzteblatt International 108: 216-U37.	abstract	Not system. review
410	Verse T, Bodlaj R, de la Chaux R, *et al.*. (2009): Guideline: Treatment of obstructive sleep apnea in adults. Hno 57: 1136–+.	abstract	Practice guideline
411	Verse T, de la Chauxz R, Dreherz A, *et al.*. (2008): Guideline: Treatment of adult obstructive sleep apnea. Laryngo-Rhino-Otologie 87: 192–204.	abstract	Practice guideline
412	Villa MP, Miano S & Rizzoli A (2012): Mandibular advancement devices are an alternative and valid treatment for pediatric obstructive sleep apnea syndrome. Sleep and Breathing 16: 971–976.	abstract	Not relevant
413	Viviano JS (2004): Assessing orthotic normalization of pharyngeal dynamics. Cranio-the Journal of Craniomandibular Practice 22: 192–208.	abstract	Not relevant
414	Vlastos IM & Hajiioannou JK (2010): Clinical practice - Diagnosis and treatment of childhood snoring. European Journal of Pediatrics 169: 261–267.	abstract	Not relevant
415	Vukcevic M (2011): [Modalities in the treatment of obstructive breathing in sleep]. Glas system. reviewpska akademija nauka i umetnosti Odeljenje medicinskih nauka 75–83.	abstract	Not relevant
416	Waite PD (1998): Obstructive sleep apnea - A review of the pathophysiology and surgical management. Oral Surgery Oral Medicine Oral Pathology Oral Radiology and Endodontics 85: 352–361.	abstract	Not system. review
417	Weaver TE, Calik MW, Farabi SS, Fink AM, Galang-Boquiren MT, Kapella MC, Prasad B & Carley DW (2014): Innovative treatments for adults with obstructive sleep apnea. Nat Sci Sleep 6: 137–147.	abstract	Not relevant
418	White DP (2006): Sleep apnea. Proceedings of the American Thoracic Society 3: 124–8.	abstract	Not relevant
419	Won CHJ, Li KK & Guilleminault C (2008): Surgical treatment of obstructive sleep apnea: upper airway and maxillomandibular surgery. Proceedings of the American Thoracic Society 5: 193–9.	abstract	Not relevant
420	Woodson BT (2008): Structural effectiveness of pharyngeal sleep apnea surgery. Sleep Medicine Reviews 12: 463–479.	abstract	Not relevant
421	Woodson BT (2010): Non-pressure therapies for obstructive sleep apnea: surgery and oral appliances. Respir Care 55: 1314–1321; discussion 1321.	abstract	Not relevant
422	Young D & Collop N (2014): Advances in the Treatment of Obstructive Sleep Apnea. Current Treatment Options in Neurology 16: 305.	abstract	Not system. review
423	Zeng X & Gao X (2009): [Current research of dentistry on obstructive sleep apnea hypopnea syndrome]. Beijing da xue xue bao Yi xue ban = Journal of Peking University Health sciences 41: 10–5.	abstract	Not relevant
424	[No authors] Corrections to "Comparison of the effects of continuous positive airway pressure and mandibular advancement devices on sleepiness in patients with obstructive sleep apnoea: A network meta-analysis"[Lancet Respir Med (2015) 3, 869-878.]. The Lancet Respiratory Medicine. 2015;3(12):e44.	abstract	Not relevant
425	Aurora RN, Casey KR, Kristo D, Auerbach S, Bista system. review, Chowdhuri S, *et al.*. Practice parameters for the surgical modifications of the upper airway for obstructive sleep apnea in adults. Sleep. 2010;33(10):1408-13.	full text	Not system. review
426	Bratton DJ, Gaisl T, Wons AM & Kohler M (2015): CPAP vs Mandibular Advancement Devices and Blood Pressure in Patients With Obstructive Sleep Apnea A Systematic Review and Meta-analysis. Jama-Journal of the American Medical Association 314: 2280–2293.	full text	Other outcome
427	Iftikhar IH, Hays ER, Iverson MA, Magalang UJ, Maas AK. Effect of oral appliances on blood pressure in obstructive sleep apnea: A systematic review and meta-analysis. Journal of Clinical Sleep Medicine. 2013;9(2):165-74.	full text	Other outcome
428	Johal A, Fleming PS, Manek S & Marinho VCC (2015): Mandibular advancement splint (MAS) therapy for obstructive sleep apnoea-an overview and quality assessment of systematic reviews. Sleep and Breathing 19: 1101–1108.	full text	Overview of system. review
429	Kezirian EJ & Goldberg AN (2006): Hypopharyngeal surgery in obstructive sleep apnea - An evidence-based medicine review. Archives of Otolaryngology-Head & Neck Surgery 132: 206–213.	full text	Not relevant
430	Martínez-González J-M, Martínez-Rodríguez N, Arias-Irimia O, Martín-Arés M & Barona-Dorado C (2010): Odontostomatological therapeutic possibilities in patients with sleep apnea. Med Oral Patol Oral Cir Bucal 15: e605-610.	full text	Not system. review
431	Mattos CT, Vilani GNL, Sant'Anna EF, Ruellas ACO & Maia LC (2011): Effects of orthognathic surgery on oropharyngeal airway: a meta-analysis. Int J Oral Maxillofac Surg 40: 1347–1356.	full text	Not relevant
432	Maurer JT (2009): Update on surgical treatment for sleep apnoea. Swiss Medical Weekly 139: 624–629.	full text	Not system. review
433	Maurer JT (2010): Surgical treatment of obstructive sleep apnea: standard and emerging techniques. Current	full text	Not system. review

	Opinion in Pulmonary Medicine 16: 552–558.		
434	Mohsenin N, Mostofi MT & Mohsenin V (2003): The role of oral appliances in treating obstructive sleep apnea. J Am Dent Assoc 134: 442–449.	full text	Not system. review
435	Ngiam J, Balasubramaniam R, Darendeliler MA, Cheng AT, Waters K & Sullivan CE (2013): Clinical guidelines for oral appliance therapy in the treatment of snoring and obstructive sleep apnoea. Aust Dent J 58: 408–419.	full text	Not system. review
436	Okuno K, Pliska BT, Hamoda M, Lowe AA & Almeida FR (2016): Prediction of oral appliance treatment outcomes in obstructive sleep apnea: A systematic review. Sleep Med Rev 30: 25–33.	full text	No eligible outcome
437	Pirsig W & Verse T (2000): Long-term results in the treatment of obstructive sleep apnea. European Archives of Oto-Rhino-Laryngology 257: 570–577.	full text	Not system. review
438	Prinsell JR (2012): Primary and Secondary Telegnathic Maxillomandibular Advancement, With or Without Adjunctive Procedures, for Obstructive Sleep Apnea in Adults: A Literature Review and Treatment Recommendations. Journal of Oral and Maxillofacial Surgery 70: 1659–1677.	full text	Not system. review
439	Rosário HD, Oliveira GMS, Freires IA, de Souza Matos F & Paranhos LR (2016): Efficiency of bimaxillary advancement surgery in increasing the volume of the upper airways: a systematic review of observational studies and meta-analysis. Eur Arch Otorhinolaryngol.	full text	Not relevant
440	Saffer F, Lubianca Neto JF, Lubianca JFL, Rösing C, Dias C & Closs L (2015): Predictors of success in the treatment of obstructive sleep apnea syndrome with mandibular repositioning appliance: a systematic review. Int Arch Otorhinolaryngol 19: 80–85.	full text	No eligible outcome
441	Saffer F, Lubianca Neto JF, Rösing C, Dias C, Closs L. Erratum: Predictors of Success in the Treatment of Obstructive Sleep Apnea Syndrome with Mandibular Repositioning Appliance: A Systematic Review (International Archives of Otorhinolaryngology (2015) 19 367). International Archives of Otorhinolaryngology. 2014;19(4):367.	full text	Not relevant
442	Schmidt-Nowara W, Lowe A, Wiegand L, Cartwright R, Perez-Guerra F & Menn S (1995): Oral appliances for the treatment of snoring and obstructive sleep apnea: a review. Sleep 18: 501–510.	full text	No eligible primary studies
443	Senn O, Bloch KE, Iseli A, Hochban W, Finkelstein Y, Boudewyns, *et al.*. Oral appliances for the treatment of snoring and obstructive sleep apnea. Oto-Rhino-Laryngologia Nova. 2001;11(4):168-77.	full text	Not system. review
444	Sommer JU, Maurer JT, Hörmann K & Stuck BA (2012): [Randomized controlled trials in the surgical treatment of obstructive sleep apnea]. HNO 60: 294–299.	full text	Not system. review
445	Sundaram S, Bridgman SA, Lim J & Lasserson TJ (2005): Surgery for obstructive sleep apnoea. Cochrane Database Syst Rev CD001004.	full text	No eligible intervention
446	Sundaram S, Lim J & Lasserson TJ (2005): Surgery for obstructive sleep apnoea in adults. Cochrane Database of Systematic Reviews. John Wiley & Sons, Ltd.	full text	No eligible intervention
447	Sujanska A, Durdik P, Jesenák M, Banovcin P, Rabasco J, Vitelli O, *et al.*. Obstructive sleep apnea syndrome in children - the recent view on the treatment. Advances in Respiratory Therapy Research. 2014:177-90.	full text	Book chapter
448	Verse T, Hierl T. Maxillofacial surgeries. Surgery for Sleep Disordered Breathing. 2010:167-92.	full text	Book chapter
449	Zancanella E, Haddad FM, Oliveira LAMP, Nakasato A, Duarte BB, Soares CFP, *et al.*. Obstructive sleep apnea and primary snoring: Treatment. Brazilian Journal of Otorhinolaryngology. 2014;80(1 SUPPL. 1):S17-S28.	full text	Not system. review
450	Taylor BA, Brace M & Hong P (2014): Upper airway outcomes following midface distraction osteogenesis: a systematic review. J Plast Reconstr Aesthet Surg 67: 891–899.	full text	Syndromic patients
451	Al-Jewair TS; Gaffar BO; Flores-Mir C. - Quality Assessment of Systematic reviews on the Efficacy of Oral Appliance Therapy for Adult and Pediatric Sleep-Disordered Breathing. - J Clin Sleep Med 2016;12(8):1175–1183.	full text	Not system. review
452	Sánchez-de-la-Torre M, Barbé F. What treatment wins in the battle against sleepiness? The Lancet Respiratory Medicine. 2015;3(11):828-9.	full text	Not system. review
453	Kotecha B (2006): Managing snoring and severe OSA. The Practitioner 250: 49–50.	full text	Not system. review
454	Laniado N, Goldberg R & Fry JM (1993): Addressing snoring and obstructive sleep apnea: a problem often overlooked in women. Compendium (Newtown, Pa) 14: passim-1572, 1574, 1576 passim.	full text	Not system. review
455	Monod M-L & Pasche P (2002): [Sleep apnea syndrome and snoring: what is the role of surgery?]. Revue medicale de la Suisse romande 122: 273–6.	full text	Not system. review
456	Simonds AK (2001): Managing obstructive sleep apnoea. Practitioner 245: 117–120.	full text	Not system. review
457	Tardif C (2000): [Treatment of sleep apnea syndromes]. Presse Med 29: 1083–1090.	full text	Not system. review
458	Petitjean T, Chammas N, Langevin B, Philit F & Robert D (2000): Principles of mandibular advancement device applied to the therapeutic of snoring and sleep apnea syndrome. Sleep 23 Suppl 4: S166-171.	full text	Not system. review
459	Petitjean T, Garcia Tejero MT, Langevin B, Philit F & Robert D (2000): [Mandibular advancement orthoses used in the treatment of obstructive sleep apnea syndrome]. Rev Mal Respir 17 Suppl 3: S69-79.	full text	Not system. review
460	Petitjean T, Langevin B, Idrissi SM, Philit F, Garcia Tejero MT & Robert D (2002): [Treatment of obstructive sleep apnea syndrome with mandibular advancement appliances]. Rev Stomatol Chir Maxillofac 103: 170–180.	full text	Not system. review
461	Main C, Liu Z, Welch K, Weiner G, Jones SQ & Stein K (2009): Surgical procedures and non-surgical devices for the management of non-apnoeic snoring: a systematic review of clinical effects and associated treatment costs. Health Technol Assess 13: iii, xi–xiv, 1-208.	full text	Not relevant
462	Randerath WJ, Verbraecken J, Andreas S, *et al.*. (2011): Non-CPAP therapies in obstructive sleep apnoea. Eur Respir J 37: 1000–1028.	full text	Double report
463	Randerath W, Bauer M, Blau A, *et al.*. (2007): [Are there alternative therapeutical options other than CPAP in the treatment of the obstructive sleep apnea syndrome]. Pneumologie (Stuttgart, Germany) 61: 458–66.	full text	Not system. review
464	Ferguson KA, Cartwright R, Rogers R & Schmidt-Nowara W (2006): Oral appliances for snoring and obstructive sleep apnea: A review. Sleep 29: 244–262.	full text	Not system. review
465	Attias E, Chabolle F, Crampette L, *et al.*. (2000): Clinical and economic evaluation of surgery in the treatment of chronic obstructive sleep apnea. Revue Des Maladies Respiratoires 17: S5–S48.	No abstract found	
466	Hochban W, Brandenburg U & Peter JH (1995): [Surgical treatment of obstructive sleep apnea by maxillary and mandibular osteotomy]. Fortschritte der Kiefer- und Gesichts-Chirurgie 40: 65–72.	No abstract found	

467	Takahashi Y, Shimizu T & Hishikawa Y (1993): [Treatment of sleep apnea syndrome]. Kokyu To Junkan 41: 841–844.	No abstract found
468	Levy P, Bettega G, Pepin JL. Surgical management options for snoring and sleep apnoea. European Respiratory Monograph. 1998;3(10):205-26.	No full-text found

eTable 4. Methodological quality of included systematic reviews.

Nr.	Citation	1. Was an 'a priori' design provided?	2. Was there duplicate study selection and data extraction?	3. Was a comprehensive literature search performed?	4. Was the status of publication (i.e. grey literature) used as an inclusion criterion?	5. Was a list of studies (included and excluded) provided?	6. Were the characteristics of the included studies provided?	7. Was the scientific quality of the included studies assessed and documented?	8. Was the scientific quality of the included studies used appropriately in formulating conclusions?	9. Were the methods used to combine the findings of studies appropriate?	10. Was the likelihood of publication bias assessed?	11. Was the conflict of interest included?
1	Abdullatif (2016) (e11)	No	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
2	Ahrens (2011) (e12)	No	Yes	Yes	No	No	No *2	No	No	NA	No	No
3	Bartolucci (2016) (e13)	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No
4	Bratton (2015) (e14)	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	No
5	Bridgman and Dunn (2000) (e15)	No	Yes	Yes	Yes	No	No	Yes	Yes	NA	No	No
6	Caldas (2009) (e16)	No	Yes	No	No	No	Yes	Yes	No	NA	No	No
7	Camacho (2015) (e17)	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No
8	Caples (2010) (e18)	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
9	Carvalho (2007, 2016) (e19, e20)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA	Yes	No
10	Health Quality Ontario (2009) (e21)	No	No	Yes	No	No	Yes	Yes	Yes	Yes	No	No
11	Hoekema (2004) (e22)	No	No	Yes	Yes	No	Yes	Yes	Yes	No	No	No
12	Holty and Guilleminault (2010) (e23)	No	Yes	No	No	No	Yes	No	No	No	No	No
13	Hsieh and Liao (2013) (e24)	No	Yes	No	No	No	Yes	Yes	Yes	NA	No	No
14	Huynh (2016) (e25)	Yes	Yes	Yes	No	Yes	Yes	No *3	Yes	No	No	No
15	Knudsen (2015) (e26)	No	No	Yes	No	No	No	No	No	Yes	Yes	No
16	Li (2013) (e27)	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	No
17	Lim (2004) (e28)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No
18	Machado-Júnior (2016) (e29)	No	No	No	No	No	Yes	No	No	No	No	No
19	Marcus (2012) (e30)	No	No	Yes	No	No	No	Yes	Yes	NA	No	No
20	Marklund (2012) (e31)	No	No	Yes	No	No	Yes	Yes	Yes	NA	No	No
21	Nazarali (2015) (e32)	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
22	Okuno (2014) (e33)	No	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	No
23	Pirklbauer (2011) (e34)	No	No	No	No	No	Yes	Yes	No	NA	No	No
24	Ramar (2015) (e35)	No	No	Yes	No	No	No	Yes	Yes	Yes	Yes	No
25	Serra-Torres (2016) (e36)	No	No	Yes	No	No	Yes	Yes	No	NA	No	No
26	Sharples (2016) (e37)	No	Yes	Yes	No	No	No	Yes	No	Yes	Yes	No
27	Sher (1996) (e38) *1	Yes	Yes	No	No	No	No	No	No	NA	No	No
28	Zaghi (2016) (e39)	No	Yes	Yes	No	No	No	Yes	No	Yes	No *4	No
29	Zhu (2015) (e40)	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No

NA, not applicable.
*1 Data extracted only on MMA
*2 Dead link
*3 Inappropriate tool
*4 Funnel-like plot provided, but no statistical confirmation

eTable 5. List of included primary studies.

1	Aarab G, Lobbezoo F, Hamburger HL, Naeije M. Oral appliance therapy versus nasal continuous positive airway pressure in obstructive sleep apnea: a randomized, placebo-controlled trial. Respiration. 2011;81(5):411-9.
2	Barnes M, McEvoy RD, Banks S, Tarquinio N, Murray CG, Vowles N, Pierce RJ. Efficacy of positive airway pressure and oral appliance in mild to moderate obstructive sleep apnea. Am J Respir Crit Care Med. 2004 Sep 15;170(6):656-64.
3	Blanco J, Zamarrón C, Abeleira Pazos MT, Lamela C, Suarez Quintanilla D. Prospective evaluation of an oral appliance in the treatment of obstructive sleep apnea syndrome. Sleep Breath. 2005 Mar;9(1):20-5.
4	Bloch KE, Iseli A, Zhang JN, Xie X, Kaplan V, Stoeckli PW, Russi EW. A randomized, controlled crossover trial of two oral appliances for sleep apnea treatment. Am J Respir Crit Care Med. 2000 Jul;162(1):246-51.
5	Dal-Fabbro C, Garbuio S, D'Almeida V, Cintra FD, Tufik S, Bittencourt L. Mandibular advancement device and CPAP upon cardiovascular parameters in OSA. Sleep Breath. 2014 Dec;18(4):749-59.
6	de Britto Teixeira, Andressa Otranto, Luciana Baptista Pereira Abi-Ramia, and Marco Antonio de Oliveira Almeida. "Treatment of obstructive sleep apnea with oral appliances." Progress in orthodontics 14.1 (2013): 10.
7	Dort L, Brant R. A randomized, controlled, crossover study of a noncustomized tongue retaining device for sleep disordered breathing. Sleep Breath. 2008 Nov;12(4):369-73.
8	Durán-Cantolla J, Crovetto-Martínez R, Alkhraisat MH, Crovetto M, Municio A, Kutz R, Aizpuru F, Miranda E, Anitua E. Efficacy of mandibular advancement device in the treatment of obstructive sleep apnea syndrome: A randomized controlled crossover clinical trial. Med Oral Patol Oral Cir Bucal. 2015 Sep 1;20(5):e605-15.
9	Gotsopoulos H, Chen C, Qian J, Cistulli PA. Oral appliance therapy improves symptoms in obstructive sleep apnea: a randomized, controlled trial. Am J Respir Crit Care Med. 2002 Sep 1;166(5):743-8. / Gotsopoulos H, Kelly JJ, Cistulli PA. Oral appliance therapy reduces blood pressure in obstructive sleep apnea: a randomized, controlled trial. Sleep. 2004 Aug 1;27(5):934-41. / Naismith SL, Winter VR, Hickie IB, Cistulli PA. Effect of oral appliance therapy on neurobehavioral functioning in obstructive sleep apnea: a randomized controlled trial. J Clin Sleep Med. 2005 Oct 15;1(4):374-80.
10	Hans MG, Nelson S, Luks VG, Lorkovich P, Baek SJ. Comparison of two dental devices for treatment of obstructive sleep apnea syndrome (OSAS). Am J Orthod Dentofacial Orthop. 1997 May;111(5):562-70.
11	Johnston CD, Gleadhill IC, Cinnamond MJ, Gabbey J, Burden DJ. Mandibular advancement appliances and obstructive sleep apnoea: a randomized clinical trial. Eur J Orthod. 2002 Jun;24(3):251-62.
12	Lam B, Sam K, Mok WY, Cheung MT, Fong DY, Lam JC, Lam DC, Yam LY, Ip MS. Randomised study of three non-surgical treatments in mild to moderate obstructive sleep apnoea. Thorax. 2007 Apr;62(4):354-9.
13	Maguire J, Steele JG, Gibson GJ, Wilson JA, Steen N, McCracken GI. Randomised cross-over study of oral appliances for snoring. Clin Otolaryngol. 2010 Jun;35(3):204-9.
14	Marklund M, Carlberg B, Forsgren L, Olsson T, Stenlund H, Franklin KA. Oral Appliance Therapy in Patients With Daytime Sleepiness and Snoring or Mild to Moderate Sleep Apnea: A Randomized Clinical Trial. JAMA Intern Med. 2015 Aug;175(8):1278-85.
15	Mehta A, Qian J, Petocz P, Darendeliler MA, Cistulli PA. A randomized, controlled study of a mandibular advancement splint for obstructive sleep apnea. Am J Respir Crit Care Med. 2001 May;163(6):1457-61.
16	Petri N, Svanholt P, Solow B, Wildschiødtz G, Winkel P. Mandibular advancement appliance for obstructive sleep apnoea: results of a randomised placebo controlled trial using parallel group design. J Sleep Res. 2008 Jun;17(2):221-9.
17	Pitsis AJ, Darendeliler MA, Gotsopoulos H, Petocz P, Cistulli PA. Effect of vertical dimension on efficacy of oral appliance therapy in obstructive sleep apnea. Am J Respir Crit Care Med. 2002 Sep 15;166(6):860-4.
18	Quinnell TG, Bennett M, Jordan J, Clutterbuck-James AL, Davies MG, Smith IE, Oscroft N, Pittman MA, Cameron M, Chadwick R, Morrell MJ, Glover MJ, Fox-Rushby JA, Sharples LD. A crossover randomised controlled trial of oral mandibular advancement devices for obstructive sleep apnoea-hypopnoea (TOMADO). Thorax. 2014 Oct;69(10):938-45. / Sharples L, Glover M, Clutterbuck-James A, Bennett M, Jordan J, Chadwick R, Pittman M, East C, Cameron M, Davies M, Oscroft N, Smith I, Morrell M, Fox-Rushby J, Quinnell T. Clinical effectiveness and cost-effectiveness results from the randomised controlled Trial of Oral Mandibular Advancement Devices for Obstructive sleep apnoea-hypopnoea (TOMADO) and long-term economic analysis of oral devices and continuous positive airway pressure. Health Technol Assess. 2014 Oct;18(67):1-296.
19	Rose E, Staats R, Virchow C, Jonas IE. A comparative study of two mandibular advancement appliances for the treatment of obstructive sleep apnoea. Eur J Orthod. 2002 Apr;24(2):191-8.
20	Villa MP, Bernkopf E, Pagani J, Broia V, Montesano M, Ronchetti R. Randomized controlled study of an oral jaw-positioning appliance for the treatment of obstructive sleep apnea in children with malocclusion. Am J Respir Crit Care Med. 2002 Jan 1;165(1):123-7.

eTable 6. Overall results for the comparison of oral appliances vs placebo on the AHI.

		Trials	Effect	95% CI	p	95% PrI	τ^2	I^2 (%)
Meta-analysis	MD	12	-11.69	-15.38,-8.01	<0.001	-22.55,-0.85	20.15	93.6
Factor		Trials	Effect	95% CI	p		τ^2	I^2 (%)
Follow-up (months)	Coefficient	11	0.25	-0.24,0.75	0.273		21.23	94.7
	Constant		-14.40	-21.20,-7.61	0.001			
% of maximum protrusion	Coefficient	8	0.03	-0.42,0.48	0.870		34.21	96.3
	Constant		-14.18	-48.70,20.34	0.354			
Appliance type (thermoplastic vs impression-based)	Coefficient	13	6.25	-3.73,16.24	0.196		17.12	89.4
	Constant		-12.17	-15.68,8.66	<0.001			
Appliance type (1- or 2-piece)	Coefficient	9	-0.09	-11.25,11.08	0.986		15.79	87.9
	Constant		-14.24	-24.81,-4.30	0.012			
Baseline BMI (kg/m^2)	Coefficient	12	1.94	-0.84,4.72	0.152		17.42	88.7
	Constant		-68.59	-150.39,13.21	0.091			
Baseline AHI (events/hour)	Coefficient	11	-0.53	-0.72,-0.34	<0.001		2.84	46.3
	Constant		1.17	-3.64,5.99	0.595			
Baseline age (years)	Coefficient	12	0.44	-1.05,1.93	0.524		21.46	91.3
	Constant		-33.59	-107.42,40.25	0.335			
Ratio of male patients	Coefficient	12	-28.65	-78.34,21.05	0.228		18.8	93.7
	Constant		10.39	-28.05,48.82	0.561			
Total sample	Coefficient	12	0.14	0.04,0.24	0.010		9.78	73.7
	Constant		-19.13	-25.29,-12.98	<0.001			
Trial (crossover or parallel)	Coefficient	12	-0.52	-8.85,7.81	0.892		22.5	94.2
	Constant		-11.38	-18.25,4.51	0.004			
Data type 1	Coefficient	12	-1.20	-10.98,8.58	0.790		22.39	94.2
	Constant		-11.49	-15.81,-7.17	<0.001			
Data type 2	Coefficient	12	8.07	-1.72,17.86	0.096		15.9	89.2
	Constant		-12.77	-16.47,-9.07	<0.001			
Data type 1	Coefficient	12	0.22	-9.36,9.79	0.274		18.15	90.2
Data type 2	Coefficient		8.12	-2.63,18.88				
	Constant		-12.82	-17.25,-8.39	<0.001			
		Trials	Effect	95% CI	p			
Reporting bias (Egger's test)	Coefficient	12	-1.24	-5.35,2.87	0.516			

CI, Confidence Intervals; PrI, Predictive Intervals; MD, Mean Differences; BMI, body mass index; Data type 1, origin of data used in the analysis 1 (increment calculated from parallel or cross-over trials); Data type 2, origin of data used in the analysis 2 (increment calculated from final values of cross-over trials).

eTable 7. Overall results for the comparison of oral appliances vs placebo on the minimum oxygen saturation.

		Trials	Effect	95% CI	p	95% PrI	τ^2	I^2 (%)
Meta-analysis	MD	6	3.33	1.38,5.28	0.007	-1.62,8.28	2.19	96.8
Factor		Trials	Effect	95% CI	p		τ^2	I^2 (%)
Follow-up (months)	Coefficient	5	-0.37	-0.61,-0.14	0.015		0.26	45.6
	Constant		7.20	4.69,9.70	0.003			
% of maximum protrusion	Coefficient	NA						
	Constant							
Appliance type (1- or 2-piece)	Coefficient	5	2.19	-13.13,17.51	0.680		3.22	92.0
	Constant		1.50	-38.15,57.79	0.770			
Baseline BMI (kg/m^2)	Coefficient	6	-0.22	-1.88,1.43	0.725		2.70	92.0
	Constant		9.82	-38.15,57.79	0.600			
Baseline AHI (events/hour)		NA						
Baseline age (years)	Coefficient	6	-0.27	-1.14,0.60	0.129		1.35	94.9
	Constant		16.42	-25.56,58.39	0.200			
Ratio of male patients	Coefficient	6	22.38	-10.19,54.96	0.129		1.35	94.9
	Constant		-14.03	-39.43,11.37	0.200			
Total sample	Coefficient	6	-0.05	-0.11,0.00	0.060		0.90	51.5
	Constant		6.48	2.91,10.05	0.007			
Trial (crossover or parallel)	Coefficient	6	1.82	-3.34,6.97	0.383		2.21	97.4
	Constant		1.90	-2.67,6.47	0.313			
Data type 1	Coefficient	NA						
	Constant							
Data type 2	Coefficient	6	-1.87	-14.97,11.22	0.712		2.69	97.4
Cons	Constant		3.37	1.04,5.70	0.016			
Data type 1	Coefficient	NA						
Data type 2	Coefficient							
Cons	Constant							
		Trials	Effect	95% CI	p			
Reporting bias (Egger's test)	Coefficient	NA						

CI, Confidence Intervals; PrI, Predictive Intervals; MD, Mean Differences; NA, not applicable; BMI, body mass index; AHI, apnea hypopnea index; Data type 1, origin of data used in the analysis 1 (increment calculated from parallel or cross-over trials); Data type 2, origin of data used in the analysis 2 (increment calculated from final values of cross-over trials).

eTable 8. Overall results for the comparison of oral appliances vs placebo on the ESS.

		Trials	Effect	95% CI	p	95% PrI	τ^2	I^2 (%)
Meta-analysis	MD	11	-1.18	-2.38,0.03	0.055	-4.76,2.40	2.12	60.6
Factor		Trials	Effect	95% CI	p		τ^2	I^2 (%)
Follow-up (months)	Coefficient	10	0.04	-0.21,0.29	0.716		3.40	67.2
	Constant		-1.56	-3.95,0.83	0.170			
% of maximum protrusion	Coefficient	7	-0.00	-0.13,0.12	0.950		3.36	66.4
	Constant		-1.48	-10.38,7.42	0.686			
Appliance type (thermoplastic or tongue suction versus impression-based)	Coefficient (thermoplast)	10	-0.83	-4.38,2.72	0.430		2.23	52.4
	Coefficient (tongue suction)		2.22	-2.34,6.78				
	Constant		-1.62	-3.31,0.08	0.059			
Appliance type (1- or 2-piece)	Coefficient	8	1.57	-2.94,6.07	0.428			
Constant	Constant		-1.87	-4.39,0.65	0.120			
Baseline BMI (kg/m^2)	Coefficient	11	-0.21	-1.30,0.88	0.671		2.60	56.5
	Constant		5.04	-27.15,37.23	0.731			
Baseline AHI (events/hour)	Coefficient	9	-0.03	-0.16,0.10	0.590		2.60	56.5
	Constant		-0.50	-3.89,2.88	0.735			
Baseline age (years)	Coefficient	11	-0.28	-0.65,0.09	0.119		1.29	40.9
	Constant		12.44	-5.41,30.29	0.149			
Ratio of male patients	Coefficient	11	-15.22	-33.47,3.02	0.092		1.11	60.1
	Constant		10.78	-3.50,25.05	0.122			
Total sample	Coefficient	11	0.01	-0.05,0.06	0.839		2.70	58.3
	Constant		-1.47	-4.57,1.63	0.312			
Trial (crossover or parallel)	Coefficient	11	1.87	-0.76,4.50	0.141			
	Constant		-2.63	-4.97,-0.28	0.032			
Data type 1	Coefficient	11	-1.87	-4.50,0.76	0.141		1.42	60.3
	Constant		-0.75	-1.93,0.43	0.185			
Data type 2	Coefficient	11	-0.93	-4.88,3.03	0.609		2.55	48.2
	Constant		-1.08	-2.49,0.32	0.115			
Data type 1	Coefficient	11	-2.12	-4.80,0.55	0.197		1.27	41.6
Data type 2	Coefficient		-1.52	-4.53,1.49				
	Constant		-0.49	-1.76,0.79	0.405			
		Trials	Coefficient	95% CI	p			
Reporting bias (Egger's test)	Coefficient	11	-0.26	-2.08,1.56	0.752			

CI, Confidence Intervals; PrI, Predictive Intervals; BMI, Body Mass Index; AHI, apnea hypopnea index; Data type 1, origin of data used in the analysis 1 (increment calculated from parallel or cross-over trials); Data type 2, origin of data used in the analysis 2 (increment calculated from final values of cross-over trials).